



# ZOONOSES AND ZOONOTIC AGENTS IN AUSTRIA

---

**REPORT 2018**





# ZOONoses AND ZOONOTIC AGENTS IN AUSTRIA



## **REPORT 2018**

Federal Ministry of Labour, Social Affairs, Health and Consumer Protection  
Austrian Agency for Health and Food Safety (AGES)

## LIST OF AUTHORS

### **Dr. Peter Much**

Austrian Agency for. Health and Food Safety  
AGES Data Statistics, Risk Assessment  
A-1220 Vienna, Spargelfeldstraße 191  
Tel.: +43 (0) 664 8398065  
E-Mail: [zoonosenbroschuere@ages.at](mailto:zoonosenbroschuere@ages.at)  
Homepage: [www.ages.at](http://www.ages.at)

### **Dr. Magdalena Arrouas**

Federal Ministry of Labour, Social Affairs, Health and Consumer Protection (BMASGK)  
Public Health Care and Medical Affairs  
A-1030 Vienna, Radetzkystraße 2  
Tel.: +43 (0) 1 711 00-644637  
E-Mail: [magdalena.arrouas@sozialministerium.at](mailto:magdalena.arrouas@sozialministerium.at)  
Homepage: [www.sozialministerium.at](http://www.sozialministerium.at)

### **Dr. Ulrich Herzog**

Federal Ministry of Labour, Social Affairs, Health and Consumer Protection (BMASGK)  
Head of Field IX/B Consumer Health and Veterinary Public Health  
A-1030 Vienna, Radetzkystraße 2  
Tel.: +43 (0) 1 711 00-4824  
E-Mail: [ulrich.herzog@sozialministerium.at](mailto:ulrich.herzog@sozialministerium.at)  
Homepage: [www.sozialministerium.at](http://www.sozialministerium.at)

## ACKNOWLEDGEMENT

AGES would like to thank all the public health officers, veterinarians, food inspectors and staff members of the institutes of human and veterinary medicine, as well as staff members of food and feed laboratories, who have taken part in the collecting and reporting of data for this brochure.



# CONTENT

LIST OF ABBREVIATIONS	8
INDEX OF FIGURES	9
INDEX OF TABLES	11
INTRODUCTION	12
ZOONOSIS MONITORING IN AUSTRIA	14
MONITORING PROGRAMMES .....	14
SURVEILLANCE PROGRAMMES .....	14
AUSTRIA: OFFICIALLY FREE OF SPECIFIC EPIZOOTICS .....	15
COOPERATION BETWEEN SPECIALISTS .....	15
NATIONAL REFERENCE LABORATORIES & CENTRES .....	16
INVESTIGATIONS OF INFECTIOUS DISEASES IN HUMANS IN AUSTRIA .....	16
EU COMPARISON ON DISEASE STATISTICS IN HUMANS .....	17
SALMONELLOSIS	20
CAMPYLOBACTERIOSIS	28
LISTERIOSIS	34
VEROTOXIN-PRODUCING <i>ESCHERICHIA COLI</i> (VTEC)	40
YERSINIOSIS	46
TUBERCULOSIS CAUSED BY <i>MYCOBACTERIUM BOVIS</i>	50
BRUCELLOSIS	56
TRICHINELLOSIS	60
ECHINOCOCCOSIS	64

TOXOPLASMOSIS	68
FOOD-BORNE OUTBREAKS IN AUSTRIA	72
DEFINITION .....	72
WHY MUST OUTBREAKS BE INVESTIGATED? .....	72
WHO CARRIES OUT THE OUTBREAK INVESTIGATIONS? .....	73
ANALYSES OF FOOD-BORNE OUTBREAKS IN AUSTRIA, 2018 .....	74
TYPES OF FOOD-BORNE OUTBREAKS .....	76
FOOD-BORNE OUTBREAKS AFFECTING TWO OR MORE PROVINCES, 2018 .....	76
ANNEX	78
AUSTRIA'S POPULATION IN 2018 .....	78
ANIMAL POPULATION AND SLAUGHTERED ANIMALS IN AUSTRIA, 2018 .....	79
LIST OF NATIONAL REFERENCE LABORATORIES/CENTRES WITH CONTACTS	80

# LIST OF ABBREVIATIONS

<b>AGES</b>	Agency for Health and Food Safety (Agentur für Gesundheit und Ernährungssicherheit)
<b>B.</b>	<i>Brucella</i>
<b>BMASGK</b>	Federal Ministry of Labour, Social Affairs, Health and Consumer Protection
<b>BMNT</b>	Federal Ministry for Sustainability and Tourism
<b>BSE</b>	Bovine spongiform encephalopathy
<b>C.</b>	<i>Campylobacter</i>
<b>cfu/g</b>	Colony forming units per gram
<b>CPE</b>	Carbapenemase-producing Enterobacteriaceae
<b>DT</b>	Definitive type
<b><i>E. coli</i></b>	<i>Escherichia coli</i>
<b><i>E. granulosus</i></b>	<i>Echinococcus granulosus</i>
<b><i>E. multilocularis</i></b>	<i>Echinococcus multilocularis</i>
<b>ECDC</b>	European Centre for Disease Prevention and Control
<b>EFSA</b>	European Food Safety Authority
<b>EMS</b>	Epidemiologic Reporting System (Epidemiologisches Meldesystem)
<b>ESBL</b>	Extended spectrum Beta-Lactamase-producing Enterobacteriaceae
<b>EU</b>	European Union
<b>HUS</b>	Haemolytic Uremic Syndrome
<b>IGRA</b>	Interferon-γ-Release-Assay
<b>KBE/g</b>	Kolonie-bildende Einheiten je Gramm
<b>L.</b>	<i>Listeria</i>
<b>M.</b>	<i>Mycobacterium</i>
<b>MRSA</b>	Methicillin-resistant <i>Staphylococcus aureus</i>
<b>MS</b>	Member State
<b>MTC</b>	<i>Mycobacterium tuberculosis</i> complex
<b>NRL</b>	National Reference Laboratory
<b>NRZ</b>	National Reference Centre
<b>OBF</b>	Officially Brucellosis Free
<b>OBMF</b>	Officially <i>Brucella melitensis</i> Free
<b>OIE</b>	World Organisation for Animal Health (Office International des Epizooties)
<b>OTF</b>	Officially tuberculosis free
<b>S.</b>	<i>Salmonella</i>
<b>SARS</b>	Severe Acute Respiratory Syndrome
<b><i>T. gondii</i></b>	<i>Toxoplasma gondii</i>
<b><i>T. spiralis</i></b>	<i>Trichinella spiralis</i>
<b>VTEC</b>	Verotoxin-producing <i>Escherichia coli</i>
<b>vtx-Gen</b>	Verotoxin-Gene
<b>WGS</b>	Whole genome sequencing
<b>WHO</b>	World Health Organization
<b>°C</b>	Degrees Centigrade / Celsius



# INDEX OF FIGURES

<b>Figure 1:</b>	Incidence of salmonellosis cases per 100,000 population in Austria, 2000-2018, including illustration of the most important serovar <i>S. Enteritidis</i> and all other serovars .....	23
<b>Figure 2:</b>	The most frequently detected human <i>Salmonella</i> serovars in Austria, 2018 .....	23
<b>Figure 3:</b>	Total of poultry meat and poultry products tested in line with the control and sample plan and <i>Salmonella</i> prevalence and that of the serovars <i>S. Enteritidis</i> , <i>S. Typhimurium</i> and <i>S. Infantis</i> in Austria, 2001-2018 .....	25
<b>Figure 4:</b>	The targets specified by the EU in terms of prevalence of <i>S. Enteritidis</i> and <i>S. Typhimurium</i> including its monophasic variant in flocks of laying hens, broilers and turkeys, as well as <i>S. Enteritidis</i> , <i>S. Typhimurium</i> including its monophasic variant, <i>S. Infantis</i> , <i>S. Virchow</i> and <i>S. Hadar</i> in breeding hens, the entire number of flocks produced in the control programme and the values reached in 2018.....	26
<b>Figure 5:</b>	Number of officially tested feed samples and detection rates of <i>Salmonella</i> in Austria, 2005-2018.....	27
<b>Figure 6:</b>	Incidence of notified campylobacteriosis and salmonellosis cases per 100,000 population (columns) and monthly cases of campylobacteriosis and salmonellosis (12-month moving average of cases) in Austria, 2003-2018 (EMS/NRC-C, as of 24.01.2019; for previous years see appropriate zoonoses reports) .....	30
<b>Figure 7:</b>	Seasonal developments in cases of campylobacteriosis and isolation rates of thermotolerant <i>Campylobacter</i> from slaughtered broiler flocks in Austria, 2010-2018 (broiler flocks were not examined in 2015 and 2017).....	31
<b>Figure 8:</b>	Poultry meat tested for thermotolerant <i>Campylobacter</i> in Austria, 2018.....	32
<b>Figure 9:</b>	Prevalence of thermotolerant <i>Campylobacter</i> in Caeca of slaughtered pigs, bovines and poultry in Austria, 2006-2018 .....	33
<b>Figure 10:</b>	Incidence of culturally verified cases of invasive listeriosis and resulting fatalities (28-day mortality) in Austria, 2000-2018 (NRC-L, as of 23.01.2019).....	37
<b>Figure 11:</b>	Incidence of culturally verified cases of invasive listeriosis per 100,000 population below and above 65 years of age, 2009-2018.....	37
<b>Figure 12:</b>	Samples tested and detection rates of <i>L. monocytogenes</i> in foods in Austria, 2018 .....	39
<b>Figure 13:</b>	Incidence of VTEC cases and HUS cases in Austria, 2001-2018 (EMS/NRC-VTEC, as of 4.02.2019).....	42
<b>Figure 14:</b>	The most common identified VTEC O serotypes in cases in Austria, 2018 (EMS, NRC-VTEC, as of 4.02.2019).....	43
<b>Figure 15:</b>	Incidence of VTEC cases notified per age group per 100,000 individuals per age group from 2011-2018 (EMS/NRC-VTEC, as of 4.02.2019).....	43
<b>Figure 16:</b>	VTEC examinations and results for various foods in Austria, 2018 .....	45
<b>Figure 17:</b>	Incidence of all cases of notified yersiniosis (columns) and by age groups in Austria, 2010-2018 (EMS, NRC-Y, as of 4.02.2019).....	48
<b>Figure 18:</b>	Tuberculosis cases per 100,000 population notified and microbiologically confirmed and cases caused by <i>M. bovis</i> and <i>M. caprae</i> in Austria, 2004-2018 (EMS, as of 21.03.2019, NRC-Tb, as of 5.04.2019).....	54
<b>Figure 19:</b>	Number of human brucellosis cases, 2000-2018 (from 2009 EMS/NRL-B, as of 14.01.2019) .....	58



<b>Figure 20:</b>	Human trichinellosis cases in Austria, 2000-2018.....	62
<b>Figure 21:</b>	Number of human echinococcosis cases (cystic and alveolar) in Austria, 2002-2018 (EMS, as of 14.01.2019; prior to 2010: data from the NRC toxoplasmosis, echinococcosis, toxocarosis and other parasitoses) .....	67
<b>Figure 22:</b>	Confirmed cases of maternal and congenital toxoplasmosis cases in Austria, 2009-2018 (Toxoplasmosis laboratory at the Department of Paediatrics and Adolescent Medicine, AKH, as of 14.06.2019).....	71
<b>Figure 23:</b>	Examined cattle and small ruminants for <i>T. gondii</i> or antibodies against <i>Toxoplasma</i> in Austria, 2018.....	71
<b>Figure 24:</b>	Human infections caused by <i>S. Enteritidis</i> PT 36, Austria 2000-2018 .....	73
<b>Figure 25:</b>	Number of confirmed food-borne outbreaks and outbreak cases per 100,000 population in Austria, 2006-2018.....	75
<b>Figure 26:</b>	Outbreak percentage by agent, 2004-2018 .....	75
<b>Figure 27:</b>	Austrian population on January 1st, 2018 (STATISTIK AUSTRIA, as of 17.05.2018) .....	78





## INDEX OF TABLES

<b>Table 1:</b>	Number of food-borne outbreaks in Austria, 2006-2018 .....	74
<b>Table 2:</b>	Animal population and slaughtered animals in Austria, 2018.....	79

# OVERVIEW OF THE SITUATION

## INTRODUCTION

**EVERY YEAR, THOUSANDS OF AUSTRIANS COME DOWN WITH DISEASES THAT ARE TRANSMITTABLE BETWEEN ANIMALS AND HUMANS: THESE INFECTIOUS DISEASES ARE TERMED ZOOZOSES.**

Transmission may occur via direct contact with infected animals, following the consumption of contaminated food – primarily food products of animal origin – or by indirect contact (e.g. via a contaminated environment). Infants, elderly people, pregnant women and individuals with weak immune systems are particularly susceptible to these diseases.

Zoonoses that are animal diseases – e.g. brucellosis or bovine tuberculosis – have been controlled in Austria for decades via measures based on EU law, the recommendations of the World Organisation for Animal Health (OIE) and national legislation. As a result, our livestock population has been officially free of brucellosis and bovine tuberculosis since 1999, thanks to the successful control programmes that have been conducted.

The most common zoonotic infectious diseases in humans are currently infections with the diarrhoea pathogens *Campylobacter* and *Salmonella*, which are mainly ingested via food. Controlling these pathogens within animal stocks is difficult, as food-producing animals may be colonised by these bacteria without being diseased themselves. Thus, animals may be hosts to a large number of these pathogens without showing signs of sickness, while humans may be infected as soon as they consume products coming from these animals or products that have been exposed to the excrement of such animals.

There are specially designed programmes in place to survey these bacteria. They are applied to combat *Salmonella* in the most affected animal populations – such as laying hens, broilers and turkeys and their parent generations. Additionally, monitoring programmes are used along the food chain, such as in the case of *Campylobacter* monitoring. The success of the programmes depends on close cooperation between the Federal Government, the provincial Public Health Directorates and the Agency for Health and Food Safety (AGES). In addition, the Federal Ministry for Sustainability and Tourism (BMNT) and local authorities are

also included in the programmes. Specific surveillance programmes ensure nationwide inspections of animal health status using statistically based sampling plans. New pathogens, so-called new emerging zoonotic agents, appear on a regular basis. These have caused new epidemics, such as the outbreaks of SARS (Severe Acute Respiratory Syndrome, originating in Asia), Influenza A (A(H1N1)pdm09 in 2009 “swine flu”), West Nile virus (in Romania and Greece), MERS-CoV (Middle East Respiratory Syndrome Coronavirus since 2012) and the Zika virus (mainly in South America, since 2015). However, even known pathogens may acquire new virulence factors and cause severe infections like verotoxin producing *Escherichia coli* (VTEC) strains causing Haemolytic Uremic Syndrome (HUS) in humans. The VTEC O104:H4 outbreak in 2011, which affected Germany particularly severely, introduced a new strain of bacteria: this strain had developed from a human enteroaggregative *Escherichia coli*, which had acquired various virulence genes that intensified its pathogenic potential, such as forming specific organelles allowing it to stick to human intestinal cells or showing antimicrobial resistances and the ability to produce verotoxin 2. More than 3,000 people were infected by this bacterial strain in 2011 in Europe, 53 of whom died.

The Federal Ministry of Labour, Social Affairs, Health and Consumer Protection (BMASGK) initiates programmes to monitor the incidence of infectious pathogens in such animals and foods that host these pathogens and could serve as a vehicle for the infection of humans. The data gathered is then used to design control and prevention strategies.





Another risk potential for humans is pathogens resistant to antibiotics: these are bacteria that are not affected when treated with antimicrobial agents that are usually effective when treating the same species of bacteria. Multidrug-resistant bacteria have resistances to three or more antimicrobial classes. Such bacteria include extended spectrum  $\beta$ -lactamase (ESBL) producing Enterobacteriaceae, carbapenemase-producing Enterobacteriaceae (CPE) and most strains of methicillin-resistant *Staphylococcus aureus* (MRSA) or *Salmonella* Typhimurium DT104. Data on antibacterial resistance and the consumption of antimicrobial substances in Austria is published in the Austrian Resistance Report (AURES) commissioned by the BMASGK and compiled by AGES and the National Reference Centre for Antimicrobial Resistance and Nosocomial Infections (Convent Hospital Elisabethinen, Linz) ([https://www.sozialministerium.at/site/Gesundheit/Krankheiten\\_und\\_Impfen/Krankheiten/Antimikro-](https://www.sozialministerium.at/site/Gesundheit/Krankheiten_und_Impfen/Krankheiten/Antimikro-)

[bielle\\_Resistenz/AURES\\_der\\_oesterreichische\\_Antibiotikaresistenz\\_Bericht](https://www.sozialministerium.at/site/Gesundheit/Krankheiten_und_Impfen/Krankheiten/Antimikrobielle_Resistenz/AURES_der_oesterreichische_Antibiotikaresistenz_Bericht) or <https://www.ages.at/themen/ages-schwerpunkte/antibiotika-resistenzen/resistenz-berichte/>).

If infections or diseases occur in two or more individuals that can be traced back to the consumption of the same food product or the food products from one specific food company, they are referred to as food-borne outbreaks. The Zoonoses Law of 2005 obliges the authorities responsible to investigate food-borne outbreaks and carry out the appropriate epidemiological and microbiological analyses.

The 2018 Zoonoses Report should give consumers a basic overview of the situation in regard to zoonoses among food-producing animals, food products and humans and provide information on the incidence of food-borne outbreaks in Austria.

# ZOONOSIS MONITORING IN AUSTRIA

During the monitoring of zoonoses, a continuous stream of precise data about the occurrence of zoonotic pathogens is collected along the entire food chain from the environment, farm animals and food products up to and including consumers. Targeted measures can be taken using these facts and figures to interrupt the transmission chain of such pathogens to protect humans and animals from these types of diseases.

This 2018 Zoonoses Report is based on the data collected and compiled for the European Union Summary Report on Trends and Sources of Zoonoses in 2018. The annual zoonoses reports of each European

Union Member State contains the results of each country's surveillance activities. The European Food Safety Agency (EFSA) collects these reports, together with the European Centre for Disease Prevention and Control (ECDC), and publishes a Europe-wide report on zoonoses in the EU. The latest version available is "The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017-EUSR 2017" – published on the following website: <https://doi.org/10.2903/j.efsa.2018.5500>. The EUSR is the most downloaded report from the EFSA's website and this EFSA report has the most citations in scientific literature<sup>1</sup>.

## MONITORING PROGRAMMES

The term monitoring refers to the continual observation, assessment and reviewing of a situation or changes arising therefrom; data on health and environmental parameters is collected at public and veterinary health authorities with the goal of recognizing changes in prevalence (= proportion of infected or sick individuals in a population per defined unit of time) as early as possible.

Monitoring programmes are a system involving repeated observations, measurements and evaluations to check predefined objectives. The selection of the samples to be tested is performed on a random basis in terms of the time and location of the samples collected, taking into account epidemiological principles to provide results with the utmost level of high significance and statistical reliability.

The BMASGK has been conducting annual monitoring programmes in Austria according to the Monitoring Programme Ordinance for selected pathogens in cattle, sheep, pigs and poultry, together with public veterinary officers, assigned vets, and AGES since 2004. In 2014, a new EU Commission Implementing Decision (2013/652/EU) came into effect, focusing on the surveillance of antibiotic resistance and to be implemented by all Member States. In line with this decision, resistance to antibiotics in specific zoonotic and commensal bacteria has to be monitored in food producing animals and animal products in the retail sector.

## SURVEILLANCE PROGRAMMES

Surveillance is the continual, systematic collection, analysis and interpretation of the health status of humans and animals to recognise changes at an early stage for the purpose of control. A surveillance programme consists of the timely dissemination of results to risk managers so that they can initiate effective prevention and control measures, as well as representative data collection and analysis. Such programmes are currently the most important concept and control

methods for so-called "food-borne infectious diseases", as well as for the control of notifiable animal diseases (e.g. BSE, bovine tuberculosis and rabies), according to the World Health Organization (WHO). The EU legislation-based surveillance programmes for feeds and foods for animals and humans is conducted by Section IX of the BMASGK together with the BMNT (Federal Ministry for Sustainability and Tourism).

<sup>1</sup> Web of Science (query), Arthur Healy, EFSA Lead Editor, BIOHAZ Panel presentation "Impact of BIOHAZ publications", 25<sup>th</sup> October 2018



## AUSTRIA: OFFICIALLY FREE OF SPECIFIC EPIZOOTICS

---

Notifiable animal diseases are controlled in Austria based on EU legislation, OIE provisions and national legislation. Exact knowledge of animal health status both in the EU Member States and worldwide also prompts authorities to take rapid preventative measures – e.g. trading restrictions for live animals – to prevent the fast spread of epizootic diseases.

Live animal trading or that of their products is regulated on an EU-wide level. Austria has an “officially

disease-free” status for certain infectious zoonoses (e.g. bovine tuberculosis, bovine brucellosis and *Brucella melitensis* infections in small ruminants). Austria is obliged to conduct an annual control programme, in line with EU provisions, to retain its official disease-free status. The most important goal is to retain this official disease-free status, as well as ensure trading advantages for the Austrian economy, among others.

## COOPERATION BETWEEN SPECIALISTS

---

The early recognition of new-emerging – or re-emerging infectious diseases is a particular challenge. Intensive local and international cooperation, as well as the networking of experts from different specialist fields (human medicine, veterinary medicine, food

hygiene, microbiology, epidemiology etc.), is vital to achieve this. International information transfer is needed to guarantee zoonoses surveillance is at the same level as current scientific knowledge.

## NATIONAL REFERENCE LABORATORIES & CENTRES

---

National Reference Centres have been established in the field of human medicine for the most important infectious pathogens as part of the European network for epidemiological monitoring and surveillance. Well-established National Reference Laboratories in the fields of veterinary medicine and food testing were nominated. When notifiable zoonotic pathogens from human, animal or food materials are isolated, the laboratories are required to transfer this isolate to the relevant National Reference Centre or Laboratory, in line with the Epidemics Act (Epidemiegesetz), Zoonoses Act (Zoonosengesetz) and the Food Safety and Consumer Protection Act (Lebensmittelsicherheits- und Verbraucherschutzgesetz). Molecular typing, such as whole genome sequencing (WGS) performed on bacteria isolated from ill people shows if they are closely related genetically. This means that people harbouring genetically related isolates are more likely

to share a common source of infection. The exact typing of isolates may discover the possible transmission paths of a strain along the food chain. National Reference Centres and Laboratories collaborate with other countries' Reference Laboratories and are networking with European Reference Laboratories (EURL) and the WHO and OIE Collaboration Centres.

At the back of this report, there is a list of the National Reference Centres and Laboratories dealing with the zoonotic pathogens described here. There is a list of all the National Reference Centres and Laboratories published on the homepage of the BMASGK ([https://www.sozialministerium.at/cms/site/attachments/8/7/2/CH4060/CMS1282307727776/liste\\_nationaler\\_referenzzentralen\\_-\\_labors\\_-\\_update\\_juni\\_2018.pdf](https://www.sozialministerium.at/cms/site/attachments/8/7/2/CH4060/CMS1282307727776/liste_nationaler_referenzzentralen_-_labors_-_update_juni_2018.pdf)).

## INVESTIGATIONS OF INFECTIOUS DISEASES IN HUMANS IN AUSTRIA

---

The doctor consulted and medical microbiology laboratory have to report the diagnosis of a notifiable infectious disease to the appropriate district authority. The staff of the district authority have to enter every suspicion, illness and death into an electronic register system, known as the EMS (epidemiologic reporting system; Epidemiologisches Meldesystem). These reports are automatically brought together and are forwarded to the district public health officer for further investigation, as necessary. Measures to prevent the further spreading of the illnesses are taken, as neces-

sary. The Provincial Medical Service Headquarters in each of Austria's provinces monitors and coordinates the activities of the local administrative authorities working in their field. The BMASGK publishes reports by the district authorities as quarterly statistics on notifiable infectious diseases (Statistik meldepflichtiger übertragbarer Infektionskrankheiten). At the beginning of the following year, the preliminary figures for the number of cases in the previous year are published, and confirmed during the course of the year (annual statistics for reportable infectious diseases).



## EU COMPARISON ON DISEASE STATISTICS IN HUMANS

---

A comparison of disease statistics in humans is made with other EU states and the EU average, as part of which the incidence of reported cases per 100,000 population per year is compared with other Member States. This comparison is only possible to a limited degree, as there is no reporting system harmonisation among the different Member States. It can also be the case that persons with diarrhoea-related illnesses seek medical help to differing extents in different EU countries, doctors send stool samples to microbiological laboratories to differing degrees in different countries and laboratories do not always report potentially positive infectious evidence to the appropriate authorities. This results in reports that incidences in some Member States are below EU average levels. However, this is still noticeable when tourists returning from holiday regions with, for instance, supposedly very low incidences of salmonellosis have frequently higher levels of *Salmonella*-related illnesses in comparison to the local population. Further observations reinforce the suspicion of unreal *Salmonella* incidences, when

*Salmonella* can be found frequently in the animal population of such Member States. As part of EU-wide baseline studies on the frequency of *Salmonella* in different farm animal populations, which particularly come into question as a source for illnesses in humans – such as laying hen flocks – all Member States were required to use one and the same method to check their farm animal populations to allow EU-wide direct comparisons.

Trends in human diseases and illnesses for most pathogens can be evaluated over several years using incidence as an indicator at a national level.

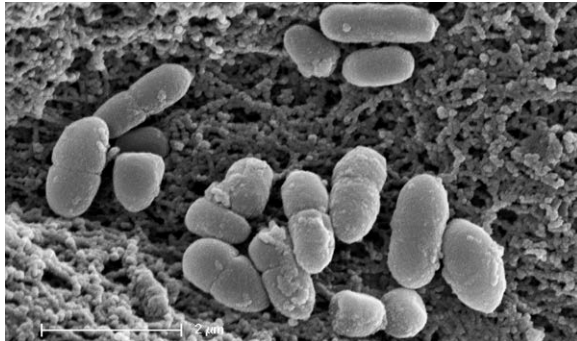
It is also noticeable that there are differing levels of awareness of different zoonotic pathogens in some Member States. Certain countries have no or only poorly developed surveillance systems and/or a low level of awareness of infectious diseases that are given a high priority in Austria, such as salmonellosis, campylobacteriosis and diseases caused by VTEC.





ZOONOSES AND ZOONOTIC AGENTS  
SUBJECT TO MONITORING IN AUSTRIA

# SALMONELLOSIS



Electron microscopic image of *Salmonella* sp.

Salmonellosis is a frequent gastrointestinal infectious disease caused by bacteria of the species *Salmonella* (*S.*) and can affect both humans and animals. The two serovars *S. Enteritidis* and *S. Typhimurium* are the main sources of food-borne salmonellosis in humans throughout Europe. The zoonotic *Salmonella* must be differentiated from the pathogens causing typhus and paratyphus (*Salmonella* Typhi and *S. Paratyphi*) – a systemic infection comprising the intestine – which do not occur in Austria, but in tropical and subtropical countries with low hygiene standards.

## OCCURRENCE

This infectious disease can be found around the globe and the vectors for *Salmonella* are very diverse. Livestock can be infected by consuming feed contaminated with *Salmonella*. In poultry, *Salmonella* infection often does not clinically manifest itself and remains unnoticed. Occasionally, entire flocks of laying hens may become permanently asymptomatic carriers capable of long-term shedding. Transmission of the bacteria to the unlaidd eggs after colonisation of the chickens'

reproductive tract will result in eggs containing *Salmonella*. If these eggs are not sufficiently heated before consumption, they could pose a health risk to humans.

*Salmonella* generally grow at temperatures ranging from 10 °C to 47 °C and are not destroyed by freezing. A sure way to destroy the bacteria is heating the product to over 70 °C for at least 15 seconds.

## RESERVOIR

Domestic and farm animals (poultry, in particular), wild animals (birds) and exotic reptiles

## ROUTE OF TRANSMISSION

*Salmonella* are primarily transmitted by consuming raw or insufficiently heated food of animal origin (eggs, poultry, meat of other animals and raw milk). Additionally, home-made products containing raw eggs – such as tiramisu, mayonnaise, cream and ice cream – may be contaminated with *Salmonella* bacteria.

Raw or insufficiently heat-treated meat (e.g. poultry meat, kebab meat, minced meat, raw sausages) may present a risk when processed if it gets into contact with other products that are not going to be heated again (e.g. potato salad). This contamination of other foods (cross contamination) may also be caused by

insufficiently cleaned household items and utensils, such as cutting boards, knives and towels or even unwashed hands. Great attention should also be paid to the continued refrigeration of the raw products when preparing food, in addition to kitchen hygiene. A small number of cases of salmonellosis are caused by smear infections, the involuntary acquisition of *Salmonella* via contact with infected individuals, animals or items that have been contaminated with faeces. Exotic pets (primarily tortoises and iguanas) must also be considered a potential source of such smear infections. It is recommended to wash your hands thoroughly with soap and warm water following any contact with animals.





## INCUBATION PERIOD

6-72 hours, usually 12-36 hours.

## SYMPTOMS

Symptoms of the disease may be the following: nausea, diarrhoea, fever, vomiting, cardiovascular problems and abdominal cramps. These symptoms generally only last a few days. In many cases, the symptoms are very weak or do not appear at all,

depending on the number of bacteria ingested and the individual's immune status, among other things. Salmonellosis could lead rapidly to a life-threatening condition in elderly individuals caused by high loss of liquids and associated cardiovascular problems.

## DIAGNOSTICS

The pathogen can be detected by growing the bacteria from stool samples, maybe also from blood or pus

samples. Blood tests for specific antibodies yield no meaningful results.

## TREATMENT

The treatment of patients with gastrointestinal problems and no other risk factors by using antibiotics should only be considered in exceptions, as this could

prolong the shedding of bacteria. In most cases, therapies to re-establish the body's water and electrolyte balance are enough to ensure recovery.

## PREVENTATIVE MEASURES

Foods, in particular meat, poultry, eggs and pasta with cream fillings, should be heated well and not kept at room temperature for longer periods after cooking. It is extremely important to wash your hands thoroughly after handling raw chicken meat before continuing with other kitchen and cooking tasks. The water left after defrosting meat should be disposed of in the sink immediately and the sink rinsed with hot water. All work surfaces and equipment that come in

contact with raw poultry or other raw meat or raw eggs should be cleaned using hot water and detergent. Freshly made food – if not consumed immediately – should be left to cool and then stored in the refrigerator.

Salmonellosis patients must not handle any food if working during their illness.

## SEROTYPING AND PHAGE TYPING

All *Salmonella* are typed in the National Reference Centre for *Salmonella* (NRC-S) at AGES Graz, using serotyping according to the White-Kauffmann Le Minor scheme. A further differentiation into phage types (PT) for *S. Enteritidis* and in definitive types (DT) for *S. Typhimurium* is being more and more replaced by

molecular typing. Upon the suspicion of an outbreak, isolates from human and non-human sources are typed using molecular-biological methods like whole genome sequencing (WGS) to discover transmission routes of the pathogens.

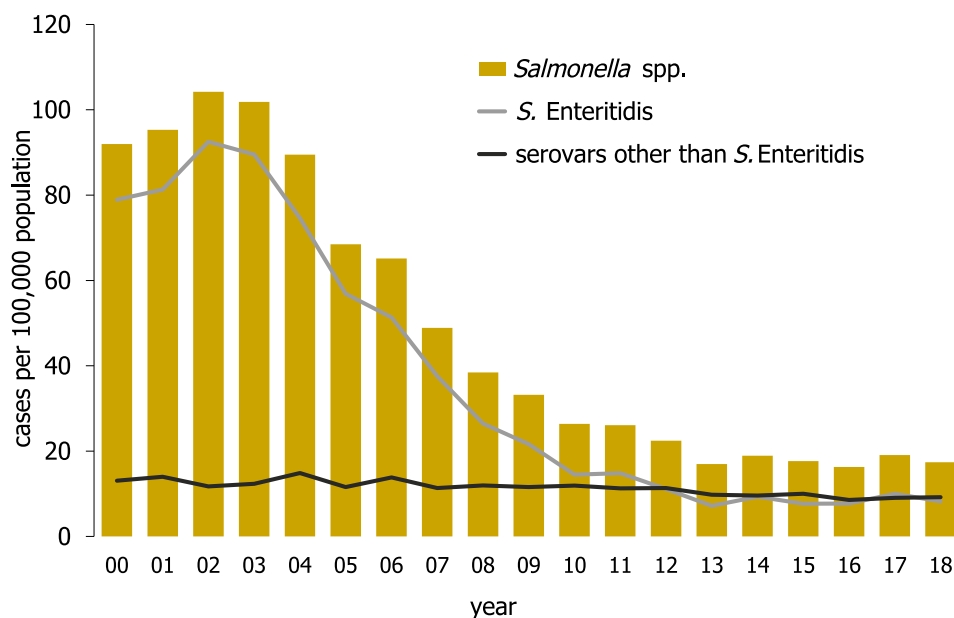
## SITUATION IN AUSTRIA, 2018

### SITUATION IN HUMANS

In 2018, 1,533 lab-confirmed cases were reported to the Epidemiological Reporting System that corresponds to an incidence of 17.4 cases per 100,000 population (Fig. 1, EMS/NRC-S as of 5.02.2019). Thus, *Salmonella* was the second most common cause of bacterial food poisoning in Austria, after *Campylobacter*.

From 2002 to 2016, the number of salmonellosis cases dropped by 83 % (2002: 8,405 first isolates;

Annual Report by the NRC-S in 2002). This decline in salmonellosis was achieved solely through a decrease in *S. Enteritidis* infections (2002: 7,459 primary isolates; 2016: 671 isolates) (Fig. 1). In 2017, salmonellosis cases increased and the augmented cases recorded (878 cases) could mainly be attributed to an increase in cases of serovar *S. Enteritidis*. In 2018, the number of *S. Enteritidis* cases declined again to 723 cases and was below the number of cases caused by all other serovars (810 cases, Fig. 2)

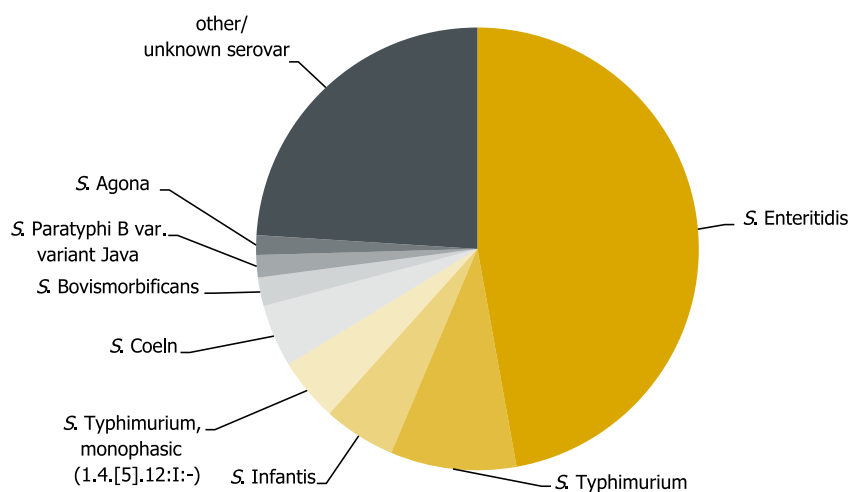


**Figure 1:**

Incidence of salmonellosis cases per 100,000 population in Austria, 2000-2018, including illustration of the most important serovar *S. Enteritidis* and all other serovars (primary isolates of *Salmonella* up to 2008, since 2009 notification rates of salmonellosis cases; EMS/NRC-S, as of 5.02.2019)

The spectrum of the most common *Salmonella* serovars in human cases has changed slightly over recent years. *S. Infantis*, the most common serovar in broilers, and the monophasic variant of *S. Typhimurium*

(likely reservoir: pigs) have become increasingly important besides *S. Enteritidis* and *S. Typhimurium* (Fig. 2).



**Figure 2:**

The most frequently detected human *Salmonella* serovars in Austria, 2018 (EMS/NRZ-S, as of 5.02.2019). Fifty isolates have not been typed either because they were diagnosed molecular-biologically (n=28) or the isolates have not been sent to the NRC-S (n=22).

## COMPARISON AUSTRIA AND THE EU<sup>2</sup>, 2017

In 2017, 91,662 confirmed human salmonellosis cases were reported in the EU by all MS. That makes *Salmonella* the second leading zoonotic agent in the EU. The incidence of salmonellosis cases notified in Austria was at 19.0/100,000 population, just below the EU average<sup>1</sup> of 19.7/100,000 population. The EU average decreased slightly compared to 2016 (20.4/100,000).

As in previous years, the Member States with the highest incidence were the Czech Republic (108/100,000) and Slovakia (106.5/100,000). The countries with the lowest incidence rates of reported and confirmed cases were Cyprus, Greece, Italy, Portugal and Romania (<7/100,000 population and no incidence figures were available from Spain: a sentinel surveillance system is in use, but without indicating data on the share of the population covered).

In the last 5 years, Finland, Italy and Germany reported decreasing trends, while a significant upwards trend was observed in Greece, Estonia, Poland, Portugal, Slovakia, Spain and the United Kingdom.

The ratio between autochthonous cases versus cases associated with travelling varied considerably between Member States with locally sourced cases varying bet-

ween 93 % and 100 % in the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, the Netherlands, Portugal, Romania, and Spain. The highest proportions of travel-related cases were reported by three Nordic countries (64-76 %).

The majority of travel-associated cases with known information (7,996 cases) on the probable country of infection, 75.2 % of the cases represented travel outside EU and 24.8 % travel within EU. Thailand, Spain, Turkey and India were the most frequently reported travel destinations (13.8 %, 8.3 %, 8.2 % and 6.7 %, respectively).

Information on *Salmonella* serovars was available for 78,949 cases. Almost half of the cases were caused by the serovar Enteritidis (49.1 %), followed by *S. Typhimurium* (13.4 %), the monophasic variant of *S. Typhimurium* (8.0 %), *S. Infantis* (2.3 %) and *S. Newport* (1.2 %). The proportion of human salmonellosis illnesses caused by *S. Enteritidis* has continued to increase since 2015. In parallel, an increase in laying hen flocks testing positive for *S. Enteritidis* – fresh eggs are the most important infectious vehicle for this serovar – can be found.

## SITUATION IN FOODS

The control and sample plan organised by the BMASGK determines the annual number of companies and foodstuffs to be inspected for each federal province (food producers, food retailers, restaurants etc.). The inspections include various samples and checks on processing methods, among others.

In 2018, 4,901 samples were tested for *Salmonella* as part of the control and sample plan, as well as in targeted campaigns. *Salmonella* was identified in 68 samples, mainly *S. Infantis* (54 times). *Salmonella* was found in 66 of 400 poultry meat samples (Fig. 3).

Poultry specimens made up 8.2 % of the entire sampled material tested for *Salmonella* although 97.1 % of all *Salmonella*-positive results came from this food

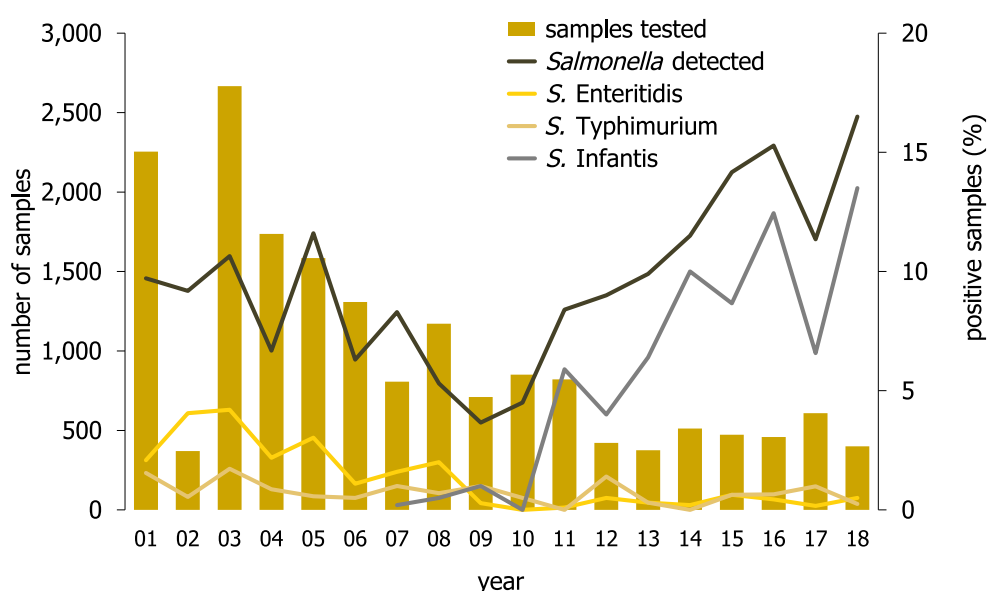
category. Twenty-eight percent (40 of 143) of raw chicken meat samples examined tested positive for *Salmonella* (37 times *S. Infantis*, and one time each *S. Enteritidis*, *S. Agona* and *S. Coeln*), so did four of 18 raw chicken meat preparations (22.2 %) and 15.8 % (22 of 139) raw poultry meat samples (duck, goose or undisclosed bird species), 13 times *S. Infantis* and seven other different serovars. No evidence of *Salmonella* was found in fresh turkey meat (51 samples), chicken meat products (four samples) and ready-to-eat, poultry meat products. *Salmonella* was detected in one sample of mixed minced meat of 839 tested samples of meat and meat products (no poultry meat), and in one sample of 23 foodstuffs intended for special nutritional uses (*Salmonella* 1,4,[5],12:-:1,2 and *S. Matopeni*).

<sup>2</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>



No *Salmonella* was found in all other examined food samples: 257 samples of cheeses (of these 191 made from raw milk); 141 samples of table eggs and 86 egg products; 854 samples of milk and milk products (of these 25 samples of raw milk); 859 samples of fruits, juices, vegetables, salads, spices, cereals and nuts; 258 samples of bakery products; 86 samples of fish, fish products and seafood; 75 samples of non-alcoholic beverages; 53 samples of infant formula; 20

samples of sweets and 950 samples of other dishes. Additionally, 5,605 samples were taken at pig slaughterhouses, 170 at broiler slaughterhouses and 47 at turkey slaughterhouses, in accordance with the process hygiene criteria. *Salmonella* was detected in 54 slaughter batches of broilers (49 times *S. Infantis*), but not in pig carcasses and in turkey slaughter batches.



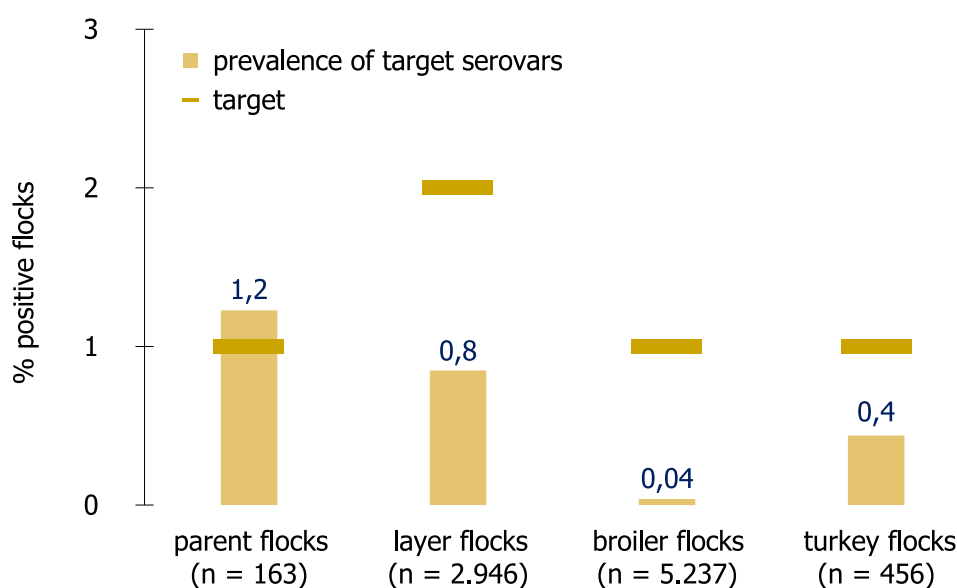
**Figure 3:**

Total of poultry meat and poultry products tested in line with the control and sample plan and *Salmonella* prevalence and that of the serovars *S. Enteritidis*, *S. Typhimurium* and *S. Infantis* in Austria, 2001-2018

## SITUATION IN ANIMALS

Foods of animal origin are the most important source of *Salmonella* infections in humans. Standardised baseline surveys on various animal populations were carried out throughout the EU over recent years to record their importance as *Salmonella* reservoirs (see earlier editions of this report). These studies confirmed that poultry (eggs and meat) plays the most important role in *Salmonella* infections in humans in Austria and all other animal species tested (except reptiles) were rarely contaminated by *Salmonella*.

Based on these studies, the EU has determined maximum levels with which poultry flocks may be contaminated with *S. Enteritidis* and *S. Typhimurium*, including its monophasic variant per year: the maximum for laying hens is set at 2 %, for broilers and turkeys 1 % and 1 % for breeding hens (target includes *S. Infantis*, *S. Virchow* and *S. Hadar*, in addition to *S. Enteritidis* and *S. Typhimurium*). The target numbers were achieved in Austria in 2018 for laying hens, broilers and turkey but not for breeding hens: two flocks of breeding hens (1.2 %) were positive for the target serovars *S. Enteritidis* (one flock) and *S. Infantis* (one flock) (Fig. 4).



**Figure 4:**

The targets specified by the EU in terms of prevalence of *S. Enteritidis* and *S. Typhimurium* including its monophasic variant in flocks of laying hens, broilers and turkeys, as well as *S. Enteritidis*, *S. Typhimurium* including its monophasic variant, *S. Infantis*, *S. Virchow* and *S. Hadar* in breeding hens, the entire number of flocks produced in the control programme and the values reached in 2018

One important serovar is *S. Infantis*: since 2016 this serovar has been the third important serovar in human diseases and the most common serovar in poultry meat and the most isolated serovar in broilers. This type of *S. Infantis* often is multidrug-resistant, i.e. resistant to three or more classes of antimicrobials (quinolones, sulfonamides and tetracyclines).

The EU *Salmonella* Control Programme intends to combat the *Salmonella* serovars in animal populations

that are the most important in terms of human infections. At present, they only include serovar *S. Enteritidis* and *S. Typhimurium* (including its monophasic variant) in broilers and turkeys and laying hens, as well as *S. Infantis*, *S. Virchow* and *S. Hadar* in parent flocks of *Gallus gallus*. Given the fact that in broilers *S. Infantis* is not among these serovars, there is no EU funding for control measures such as the possible vaccination or culling of flocks. While all flocks are tested for *Salmonella* before slaughtering, there are no legal

consequences should any serovars other than the target serovars be detected. However, more and more slaughterhouses are generally refusing to slaughter *Salmonella*-positive flocks. As a result, broiler flocks

are not being slaughtered, but culled. This strain of *S. Infantis* has settled in the broiler holdings and is very difficult to eliminate despite intensive and careful cleaning and disinfection measures.

SITUATION IN FEEDSTUFFS

Feedstuffs are subject to a permanent monitoring programme in Austria. Samples are taken from farms, warehouses, compound feed plants and retailers as part of mandatory inspections. Both ready-made compound feeds and individual components are tested officially. In 2018, *Salmonella* was detected in seven out of 323 livestock feed samples (2.2 %), concurrently three serovars in one sample of oil seeds (*S. Llandoff*, *S. Meleagridis* and *S. Tennessee*), Figure 5.. *Salmonella* sources are protein-rich extraction meals or cakes (side products from the oil processing industry). This is how *Salmonella* gets into the feed chain and may

contaminate the compound feed produced with these ingredients. Additionally, 127 samples of pet food and chewing toys were officially tested in the reporting year, 15 (12 %) of which tested positive for 19 different *Salmonella* serovars. *S. Derby* was identified six times, the monophasic variant of *S. Typhimurium* four times and *S. Infantis* three times. The handling of pet food and, in particular, chewing toys poses a certain risk to humans. Thus, it is recommended to wash your hands after feeding cats or dogs and basically after any direct contact with animals.

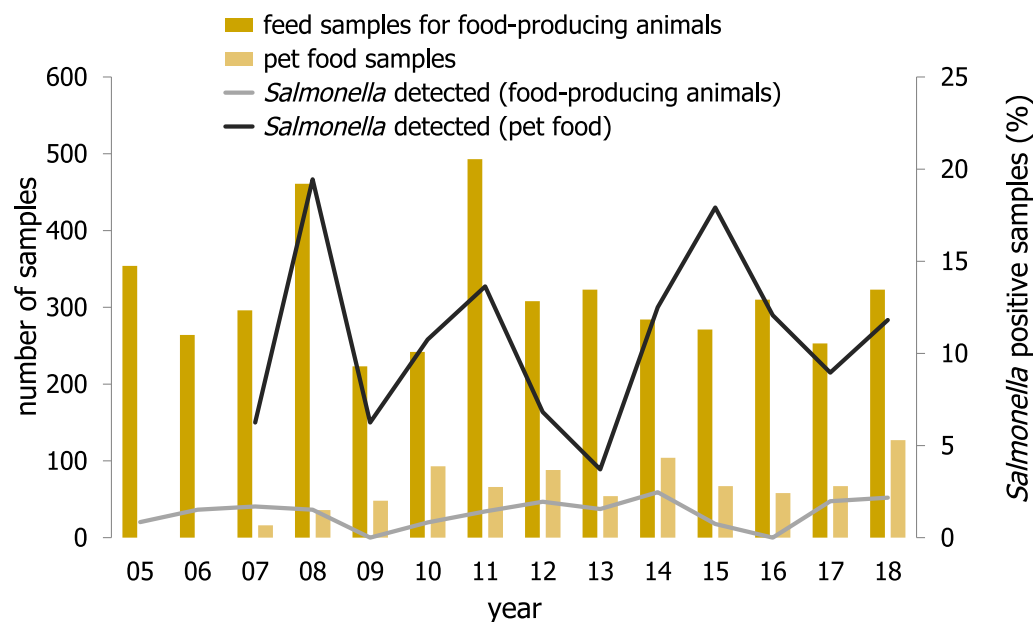


Figure 5: Number of officially tested feed samples and detection rates of *Salmonella* in Austria, 2005-2018



# CAMPYLOBACTERIOSIS



Electron microscopic image of *Campylobacter* sp.

Campylobacteriosis is an infectious disease caused by thermotolerant bacteria of the species *Campylobacter* (*C.*). *Campylobacter* are curved, gram-negative, non-spore forming bacilli. The most common species is *C. jejuni*, which results in 90 % of human cases. The bacteria are sensitive to acidic pH values and are destroyed safely using pasteurisation.

## OCCURRENCE

*Campylobacter* infections appear worldwide and occur with increasing frequency during warmer seasons (Fig. 7). They are the most important pathogens for bacterial intestinal diseases in humans, aside from

*Salmonella*. In 2018, Campylobacteriosis again topped the rankings of notified food-borne bacterial diseases in Austria.

## RESERVOIR

Poultry, swine, cattle, pets – such as cats and dogs and birds can be carriers of *Campylobacter*. These

germs potentially inhabit the intestine of these animals in which they rarely cause disease.

## ROUTE OF TRANSMISSION

Campylobacteriosis in humans is considered a predominantly food-borne infection. Insufficiently heated poultry meat and non-heated meals contaminated with that pathogen (e.g. via insufficiently cleaned household items and utensils, such as cutting boards, knives) and raw milk are considered the primary

sources of infection. Special attention must be paid to strict hygiene when preparing food to prevent cross contamination between raw meat and other foods. Direct transmission between humans (faecal-oral) is rare.

## INCUBATION PERIOD

Usually 2 to 5 days, depending on the number of bacteria ingested; around 500 colony-forming units (cfu) of the pathogen are sufficient to cause the illness in

humans. One gram of poultry skin can harbor more than 10,000 cfu of *Campylobacter*.



## SYMPTOMS

High fever, watery-to-bloody diarrhoea, frequent abdominal pain, headaches and tiredness for one to seven days. *Campylobacter* infection can result in autoimmune diseases that may even appear several weeks after termination of acute clinical symptoms.

Long-term consequences such as irritable bowel syndrome (IBS), reactive arthritis (including Morbus Reiter-arthritis, urethritis and conjunctivitis), or Guillain-Barré syndrome (GBS), a medical paralysis of the nervous system may occur.

## DIAGNOSTICS

The detection of the pathogen is confirmed after cultivation from stool samples.

## TREATMENT

In general, the disease is self-limiting and should be treated by re-establishing the body's water and electrolyte balance. Infants and patients who develop high

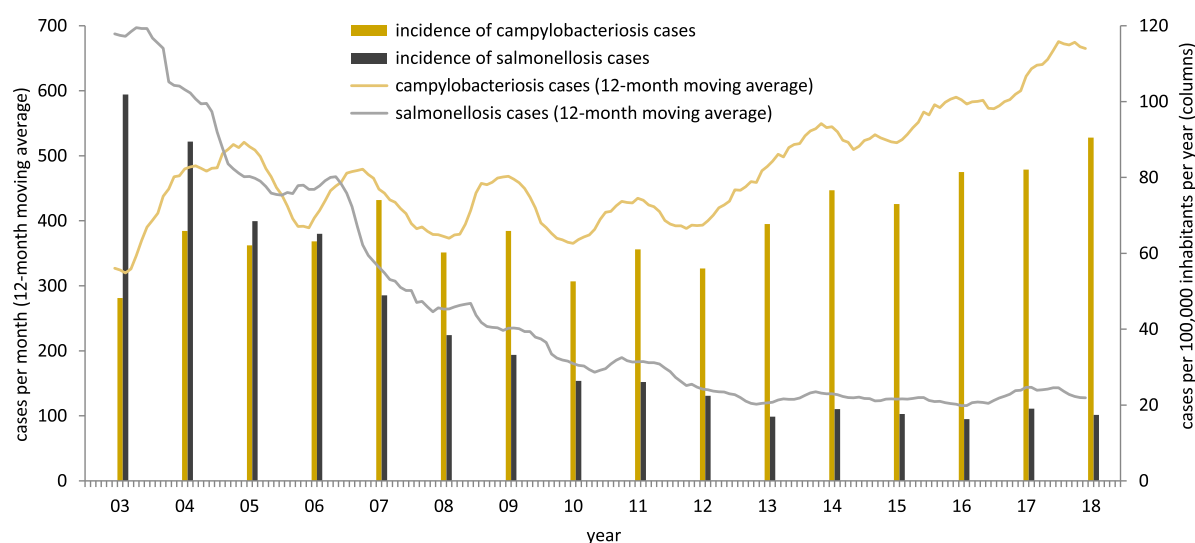
temperatures or have a weakened immune system may be treated additionally with antibiotics.

## SITUATION IN AUSTRIA, 2018

### SITUATION IN HUMANS

In 2018, 7,982 lab-confirmed campylobacteriosis cases were notified to the Epidemiological Reporting System (EMS/NRC-C as of 24.01.2019). Thus, campylobacteriosis remains the most frequently reported form of bacterial food poisoning in Austria with an incidence of 90.5/100,000 population (Fig. 6). The steady increase in human campylobacteriosis cases reached its peak in 2018. Compared to 2017, incidence levels increased strongly by 10.8 %. Figure 6 presents developments in the incidence of campylobacte-

riosis (golden columns) and salmonellosis (dark grey columns) since 2003; the 12-month moving average of cases emphasises the decline in salmonellosis cases until 2013, whereas an up and down movement could be observed in cases of campylobacteriosis until 2010, but a significant increase in cases has appeared since then. *C. jejuni* counted for 88.4 % of the specified 7,324 isolates, *C. coli* for 11.7 %; in ten patients, both species were detected.

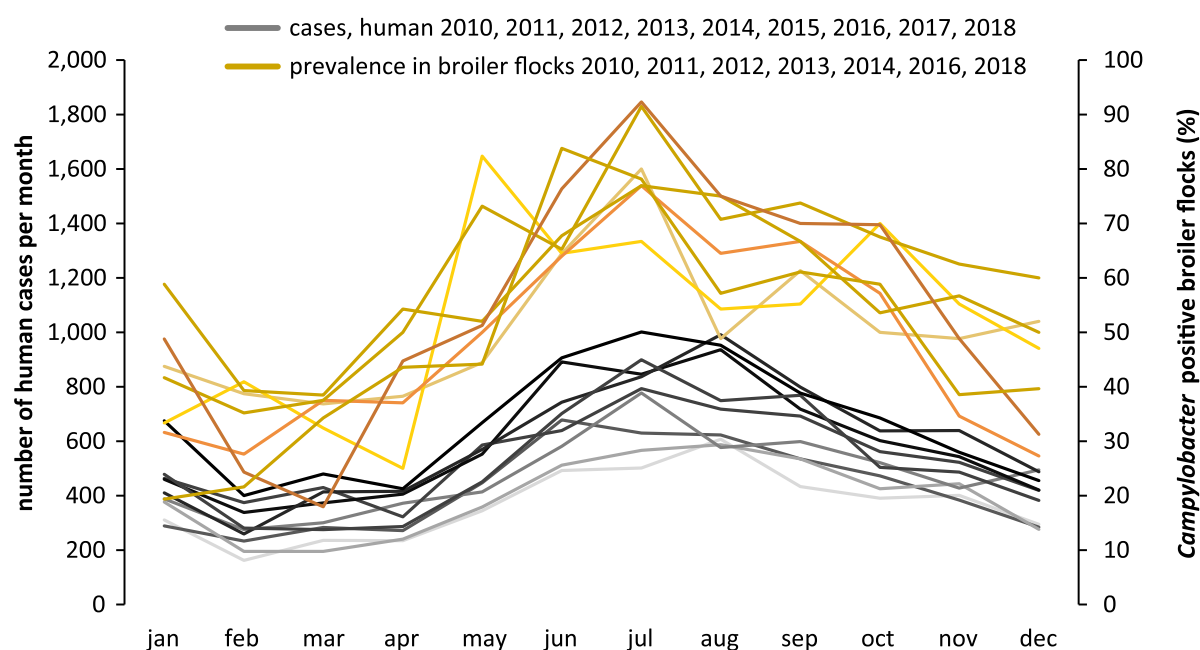


**Figure 6:**

Incidence of notified campylobacteriosis and salmonellosis cases per 100,000 population (columns) and monthly cases of campylobacteriosis and salmonellosis (12-month moving average of cases) in Austria, 2003-2018 (EMS/NRC-C, as of 24.01.2019; for previous years see appropriate zoonoses reports)

The seasonal incidence of human cases of campylobacteriosis reported has revealed similar patterns over recent years, with the least number of infections between November and April and the highest incidence of infections from June to September (Fig. 8). An almost identical picture was painted by the isolation rates of thermotolerant *Campylobacter* in slaughtered

broiler flocks, with peak rates in the summer months, suggesting higher contamination rates in fresh chicken at retailers, subsequently to this time period and, thus, pointing to this type of food as the most important bacteria vehicle for many campylobacteriosis cases.



**Figure 7:**

Seasonal developments in cases of campylobacteriosis and isolation rates of thermotolerant *Campylobacter* from slaughtered broiler flocks in Austria, 2010-2018 (broiler flocks were not examined in 2015 and 2017)

### COMPARISON AUSTRIA AND THE EU<sup>3</sup>, 2017

In 2017, 246,158 confirmed cases were notified in the EU. *Campylobacter* has been the most common bacterial pathogen in the gastrointestinal tract throughout the EU since 2005. The incidence rate of notified campylobacteriosis cases of 81/100,000 population in Austria was higher than the EU average of 64.8/100,000 population in 2017, which represents a slight decrease compared to 2016 (66.3/100,000). From 2013-2017, the trend has not shown any statistically significant increase or decrease at an EU level.

Even so, incidence rates vary widely within the EU: Greece has no surveillance system for *Campylobacter*; Bulgaria, Cyprus, Latvia, Poland, Portugal and Romania have an incidence rate of  $\leq 5.8$  per 100,000 population. The highest country specific notification rates in 2017 were observed, as in previous years, in the Czech Republic (230 cases per 100,000), Slova-

kia (128), Sweden (106) and Luxembourg (104 per 100,000). Since 2013, significant increasing trends have been observed in Austria, the Czech Republic, France, Hungary, Poland, Slovenia, Spain and Sweden. In Cyprus, a significant decrease can be found. In those cases for which a country of infection was given, 11.1 % (14,258 cases) of the infections acquired were travel associated. More than half of those inside the EU (Spain, Greece and Bulgaria); for the others, Thailand, Turkey and Morocco were mentioned most commonly.

*Campylobacter* species information was provided by all MS for more than half of the confirmed cases reported in the EU. Of these, 84.4 % were *C. jejuni*, 9.2 % *C. coli*, and the rest other non-differentiated species, comprising 6.5 % *C. jejuni*/*C. coli*/*C. lari*.

<sup>3</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>



## SITUATION IN FOODS

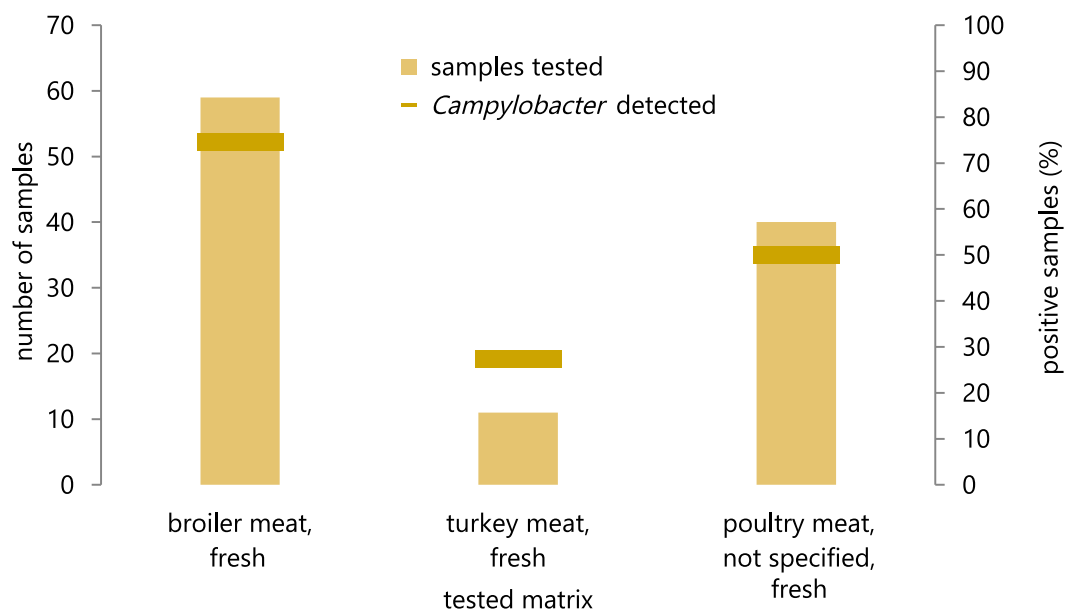
The control and sample plan organised by the BMASGK determines the annual number of companies and foodstuffs to be inspected for each federal province (food producers, food retailers, restaurants etc.). The inspections include various samples and checks on processing methods, among others.

In 2018, thermotolerant *Campylobacter* was detected in 67 of 110 fresh poultry meat samples tested (61 %), 44 of which were found in 59 (75 %) samples taken from fresh, raw chicken meat, in three of 11 samples of fresh turkey meat, in 20 of 40 samples

of unspecified fresh poultry meat (50 %) (Fig. 8).

*Campylobacter* was not detectable in all other tested foodstuffs, e.g. in 21 samples of raw milk, 77 samples of fruits and vegetables or in 45 samples of other foods, of those nine meat samples (not poultry).

The reason why beef and pork are rarely tested for *Campylobacter* is because the bacterium does not survive the meat's production conditions: the meat is left to age and the meat surface dries out, which makes these types of food only a minor source of infection in humans.

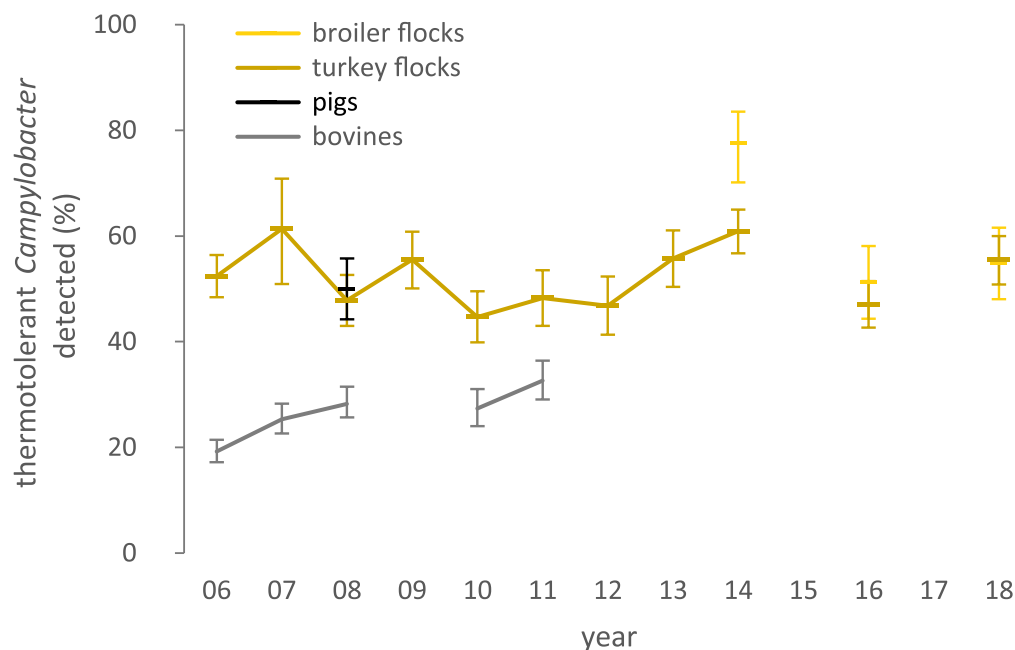


**Figure 8:**  
Poultry meat tested for thermotolerant *Campylobacter* in Austria, 2018

## SITUATION IN ANIMALS

The BMASGK carried out annual monitoring programmes in Austria in line with the Surveillance Programme Regulation with regards to selected pathogens in bovines, sheep, swine and chickens, in cooperation with public vets and AGES. The EU Commission Implementing Decision came into effect in 2014, which states that flocks of broilers and turkeys must be examined for evidence of thermotolerant *Campylobacter* every two years and that *C. jejuni* isolated in both these

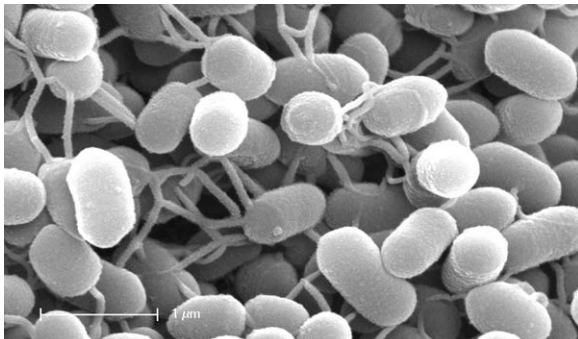
poultry populations be tested for their susceptibility to antimicrobials. In 2015 and 2017, poultry was not tested for *Campylobacter*, in 2018 the prevalence of thermotolerant *Campylobacter* was 55.5 % in broiler flocks, 54.9 % in turkey flocks. The prevalence of *Campylobacter* in slaughtered poultry flocks and other tested animals in Austria, 2006-2016 can be found in Figure 9.



**Figure 9:**

Prevalence of thermotolerant *Campylobacter* in caeca of slaughtered pigs, bovines and poultry in Austria, 2006-2018

# LISTERIOSIS



Electron microscopic image of *L. monocytogenes*

Listeriosis is an infectious disease caused by the bacterium *Listeria (L.) monocytogenes*.

## OCCURRENCE

The bacteria are frequently found in the environment, in sewage and waste water, the soil and on plants. Foods of animal origin, such as unpasteurised milk and unpasteurised dairy products or raw meat, but also processed meat and fish products such as sliced

and packed sausages and smoked fish, may contain *L. monocytogenes*. Products made from pasteurised milk, such as spreadable cheese or soft cheese, may be contaminated with *L. monocytogenes* during processing.

## RESERVOIR

*L. monocytogenes* is frequently found in the environment, soil and water. Animals can carry the bacteria without becoming sick, but miscarriages can occur in ruminants. Food processing companies may also be a possible reservoir, as food that is processed (further) could be contaminated at such locations. Furthermore, our fridge must also be considered a possible

reservoir for *L. monocytogenes*, as food stored there can become contaminated, too. *Listeria* can multiply when refrigerated, due to the unusual growth properties of the bacteria, even at low temperatures; therefore, high cfu levels of the pathogen can be found after longer storage in refrigerators on food contaminated with *L. monocytogenes*.

## MODE OF TRANSMISSION

The pathogen is predominantly ingested through consuming contaminated food of animal or plant origin. Pregnant women infected with *L. monocytogenes*, even if they do not show any symptoms of disease, themselves can transmit the bacteria to the

unborn child. In rare cases, the pathogen may spread between humans (nosocomial infections of newborns) and by direct contact with infected animals (skin infections).

## INCUBATION PERIOD

The first symptoms may show between 1-70 days, following a food-borne infection. Septicaemic disease: 1-12 days (median 2 days); neurologic disease: 1-14

days (median 9 days); pregnancy associated cases: 17-70 days (median 27.5 days).



## SYMPTOMS

The infection usually is symptomless or results in some diarrhoea in healthy adults. In general, the human immune system protects against severe forms of disease progression and many infections go unnoticed or without any serious consequences. Severe infections primarily affect patients with weak immune systems (e.g. cancer patients, or under high-dose cortisone therapy). Once listeriosis is diagnosed, there is usually an invasive progression, which means that the bacteria spread beyond the gastrointestinal tract.

Invasive listeriosis manifests in severe headaches, high fever, nausea and vomiting. Subsequently, it can lead to encephalitis or meningitis or sepsis (blood poisoning), which ends fatally for about a quarter of all patients. The bacteria may also cause inflammation in other body areas (e.g. vertebral inflammation), however, such consequences are observed rarely. There is a risk of infection to the unborn child during pregnancy, which can lead to a premature or stillbirth. Sepsis and meningitis may develop in infected newborns.

## DIAGNOSTICS

The pathogen is grown from samples taken from blood and spinal fluid, as well as from pus or from swabs taken from umbilicus, ears or meconium of newborns. The detection of the *Listeria* is performed using standardised, qualitative or quantitative methods or using molecular biological techniques. If the isolation of the bacteria was not successful due

to prior antibiotic treatment, the PCR method can be used. Serological methods are difficult to interpret due to cross-reactions with antibodies that were formed against other pathogens or missing antibody production. About 90 % of all patients are affected by the three serovars 4b, 1/2a and 1/2b.



If consumers are worried about possibly being infected after the ingestion of a recalled food product due to contamination with *Listeria*, a stool sample can be analysed to exclude an infection. If *L. monocytogenes* is detected in stool samples, a prophylactic application

of an antibiotic can be considered; although without isolation of the pathogen, the usage of antibiotics is contraindicated due to the high risks of side effects compared to the low risk of acquiring listeriosis.

## TREATMENT

Administering antibiotics. However, up to about 30 % of all invasive listeriosis cases end fatally despite targeted treatment.

## PREVENTATIVE MEASURES

**General rules to mitigate the risk of food-related infections are:**

- Wash fruit, berries and vegetables thoroughly with tap water before preparation or consumption
- Heat meat and fish dishes properly
- Boil unpasteurised milk before consumption
- Do not eat raw minced meat
- Always store potentially risky food, such as soft cheese, spreadable cheese, cut cold meats or smoked fish, separately from other foods
- Persons with weak immune system, pregnant women and old persons should not consume risky food once it has passed its use-by date.

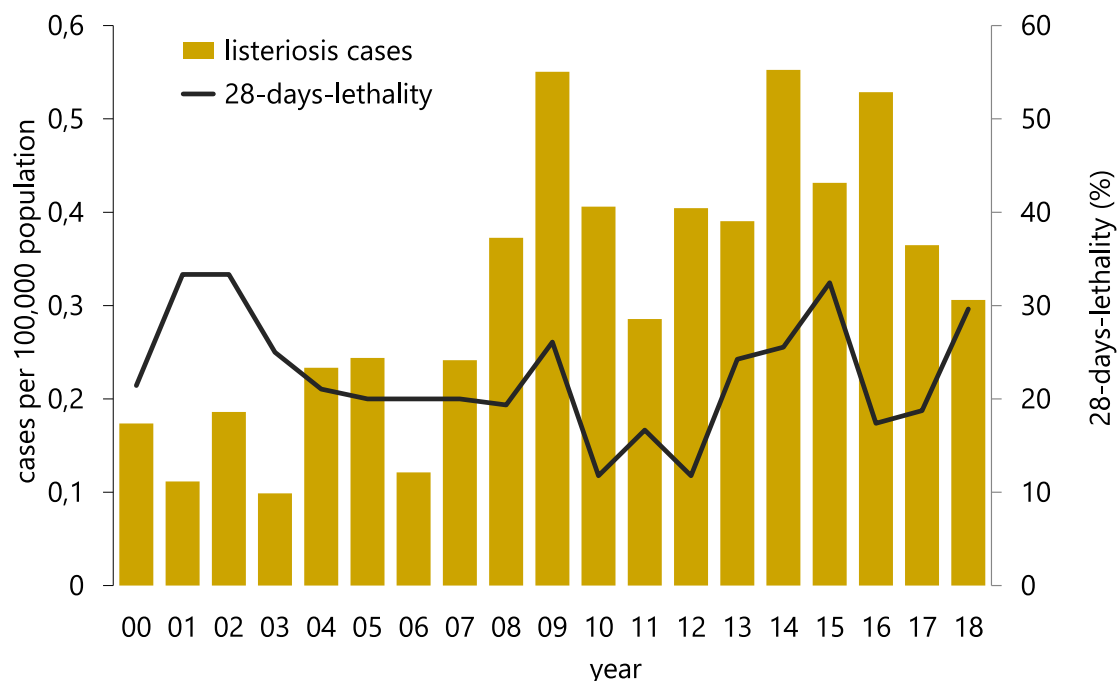
## SITUATION IN AUSTRIA, 2018

### SITUATION IN HUMANS

In 2018, 27 cases of invasive listeriosis were notified to the EMS (EMS and NRC-L, as of 23<sup>rd</sup> January 2019, Fig. 10). This equals an incidence rate of 0.31 per 100,000 population. Two pregnancy-associated

listeriosis cases were identified, one premature birth and sepsis and one case of intrauterine death. The 28-day mortality<sup>4</sup> in listeriosis cases was 30 % (8 in 27 cases).

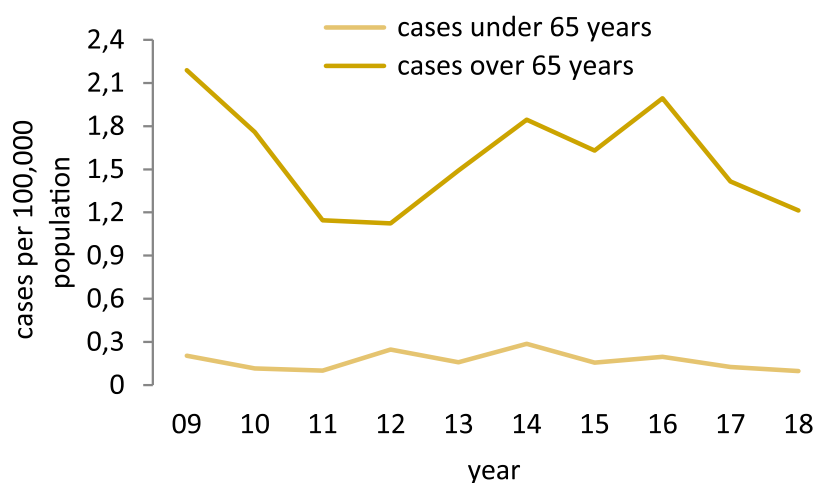
<sup>4</sup> 28-day mortality = total mortality within 28 days of diagnosis

**Figure 10:**

Incidence of culturally verified cases of invasive listeriosis and resulting fatalities (28-day mortality) in Austria, 2000-2018 (NRC-L, as of 23.01.2019)

The incidence of listeriosis in persons below 65 years of age was 0.10 per 100,000 population in that age group, and in persons of the age 65+ 1.2 per 100,000 population in that age group (Fig. 11). In 2018, the risk of coming down with listeriosis was over 12 times

higher for persons older than 65 than for younger people. In 2010, the risk of acquiring listeriosis was 15 times higher in older people; in the years 2012 and 2014 the risk was five to six times higher.

**Figure 11:**

Incidence of culturally verified cases of invasive listeriosis per 100,000 population below and above 65 years of age, 2009-2018

## COMPARISON AUSTRIA AND THE EU<sup>5</sup>, 2017

In 2017, 2,480 confirmed cases were reported in the EU. The incidence rate of notified listeriosis cases in Austria was 0.37 cases per 100,000 population, slightly lower than the EU notification rate of 0.48 cases per 100,000 population. In 2016, the EU incidence (0.47/100.000) was similar to 2017. From 2008-2017 a significant upwards trend of confirmed listeriosis cases was observed in the EU.

The highest notification rates were reported from Finland, Denmark, Luxembourg, Germany, Sweden and Belgium between 1.6 and 0.8 cases per 100,000 population. The lowest notification rates were reported by Croatia, Cyprus, Malta and Romania ( $\leq 0.2$  per

100,000). The vast majority ( $> 99\%$ ) of listeriosis cases with known country of infection ( $> 99.8\%$ ) were reported to be acquired inside the EU. The EU case fatality rate was 13.8 % (225 cases) among the cases with known outcomes.

*Listeria* infections were most commonly reported in the age group over 64 years. At EU level, the proportion of listeriosis cases in this age group has steadily increased from 55 % in 2008 to 67 % in 2017, and especially in the age group over 84 years doubled from 7.3 % to 14.8 %. The case fatality was 15.5 % and 24.2 % in these two age groups, respectively.

## SITUATION IN FOODS

The control and sample plan organised by the BMASGK determines the annual number of companies and foodstuffs to be inspected for each federal provin-

ce (food producers, food retailers, restaurants etc.). The inspections include various samples and checks on processing methods, among others.

In 2018, 2,887 food samples were tested for *Listeria* using the qualitative method applied in 25 g, and *L. monocytogenes* was found in 72 samples (Fig. 12):

- in 46 of 672 meat samples, of those in six of 47 samples of fresh meat (12.8 %), in three of 133 meat products without indication if ready-to-eat or not (2.3 %), in 11 of 294 ready-to-eat meat samples (3.8 %) and in 26 of 198 samples of cured sausages (13.1 %);
- in seven of 259 tested samples of fish and seafood, of these in four of 131 raw fish samples (3.1 %) and three of 120 smoked fish samples (2.5 %);
- in six of 517 samples of cheeses: one of 64 samples of fresh cheese made of unpasteurised milk (1.6 %), in three of 109 samples of soft cheese made from unpasteurised milk (2.7 %), two of 72 samples of soft cheese without information about the used milk (2.7 %); *Listeria* was not detected in all the other samples of cheeses (fresh cheese made from pasteurised milk or treatment status unknown; hard cheese made from pasteurised or unpasteurised milk; soft cheese made from pasteurised milk);
- in one of 44 samples of ready-to-eat salads with mayonnaise (2.3 %);
- in 12 of 627 samples of ready-to-eat foodstuffs (1.9 %)

There was no evidence of *L. monocytogenes* in 344 dairy products (of these, 26 samples of raw milk or products made from raw milk), in 204 samples of bakery products, in 131 samples of fruits and vegeta-

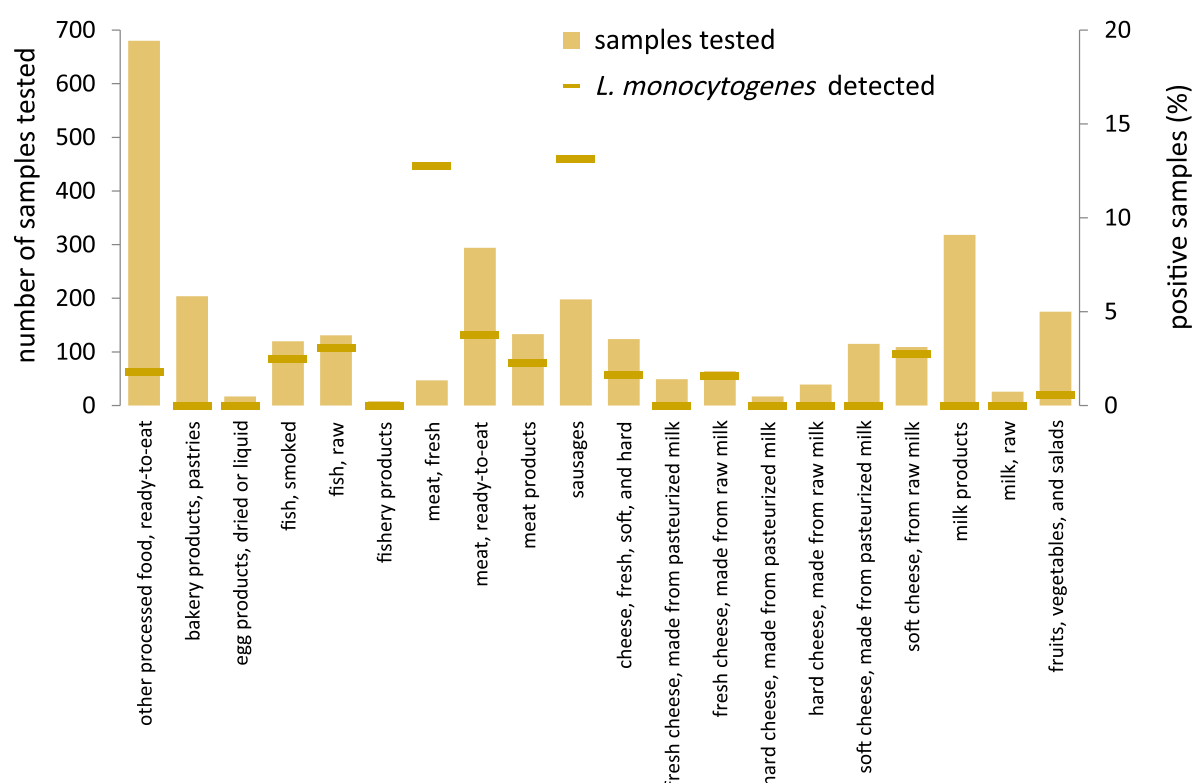
bles, 53 samples of other meals, e.g. pasta and in 52 samples of egg products.

In four samples, more than 100 colony-forming units of *L. monocytogenes* per gram of food examined

<sup>5</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>

(cfu/g) were found: one sample each of cured sausage, soft cheese (without details about the used milk), meat products (without information if ready-to-eat or not) and another meal ready-to-eat. *L. monocytogenes* at quantitative levels between 10 and 100 cfu/g tested matrix were detected in 21 samples: six samples of cured sausages, three samples of ready-to-eat fresh meat (two samples of pig meat and one of turkey meat); three samples of ready-to-eat meat products (one game meat product and two meat

products without information about the animal species), one sample of a meat product (no more details available), two samples of soft cheeses made from unpasteurised milk, one sample of fresh cheese made from unpasteurised milk, one sample of soft cheese (without details about the used milk), one sample of a ready-to-eat salad with mayonnaise, and one sample each of raw fish, smoked fish and other ready-to-eat foods/meals.



**Figure 12:**  
Samples tested and detection rates of *L. monocytogenes* in foods in Austria, 2018

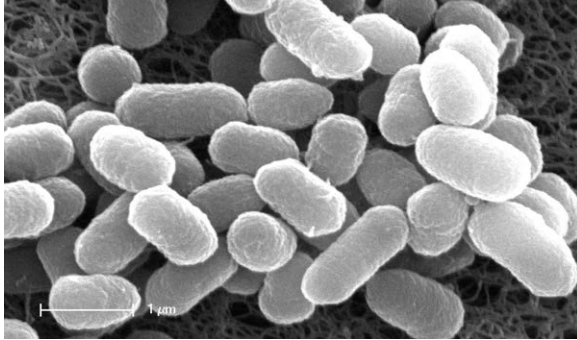
## SITUATION IN ANIMALS

In most cases, *L. monocytogenes* is not transmitted via animals, but via the inanimate environment during food processing. Thus, monitoring livestock is not considered effective for *Listeria*. Contamination with faeces is considered the most common source in unpasteurised milk. A direct invasion of the pathogen via mastitis as a source of infection could be proven

in individual cases. An outbreak of fatal listeriosis in a pig farm in Lower Austria was reported, affecting a holding with 450 fattening pigs and 35 fatal outcomes. Maize silage produced under inappropriate ensiling conditions in a silo was most likely the source of infection.



# VEROTOXIN-PRODUCING *ESCHERICHIA COLI* (VTEC)



Electron microscopic image of verotoxin-producing *E. coli*

Bacteria of the *Escherichia* (*E.*) *coli* species that have the ability to produce a specific toxin are referred to as verotoxin-producing *E. coli* (VTEC) due to this toxin. They can be classified in different serotypes (about 180 different O-serotypes at present) based on their different antigen structure. VTEC O157:H7 is considered the prototypic strain. In addition, serotype O26, O103, O111, O145, O146, O121, O128, O91, O104, and O113 also occur on a more frequent basis as pathogens resulting in human diseases. The bacteria are susceptible to heat, but survive in frozen foods and acidic environments. The terms Shiga toxin-producing *E. coli* (STEC) and enterohaemorrhagic *E. coli* (EHEC) are used synonymously for VTEC.

## OCCURRENCE

VTEC has been known as a cause of diarrhoea and kidney failure (Haemolytic Uremic Syndrome, HUS) since 1982.

## RESERVOIR

Ruminants (cattle, sheep, goats) and wild animals (roe deer and red deer)

## MODE OF TRANSMISSION

The bacteria are predominantly transmitted through consuming contaminated foods, such as raw minced beef, raw beef/pork sausages, salami, unpasteurised milk, but also plant-based foods that are cultivated in soils fertilised with cattle manure and that are eaten raw, as well as industrially produced sprouts. Other significant factors are transmission via direct contact

with ruminants (petting zoos), if hands are not cleaned properly afterwards (wash with soap); and human-to-human infection chains, which must be given particular attention in community institutions (nursery schools, old people's homes etc.). It is assumed that 50-100 cfu of VTEC bacteria would be enough to cause illness in a healthy individual.

## INCUBATION PERIOD

Between 2 and 8 days, mainly 3-4 days.

## SYMPTOMS

The disease starts with watery diarrhoea, which often turns bloody after a few days and may be accompanied by severe nausea, vomiting and abdominal pains. The disease is usually self-limiting and lasts for eight to 10 days on average. About 5-10 % of patients, in

particular infants, may develop a characteristic complication disease days after the diarrhoea has begun – the potentially fatal HUS. In this case, the toxin binds to specific receptors on cell membranes, damaging them. The blood capillaries are destroyed, which may



consequently result in kidney failure (failing to produce urine), anaemia, a reduced number of thrombocy-

tes, skin haemorrhages and neurological disorders.

## DIAGNOSTICS

---

The disease is diagnosed upon clinical suspicion by growing the bacteria from stool samples, detecting

verotoxin in the stool or (only in HUS) by detecting evidence of specific antibodies in the blood.

## TREATMENT

---

Treatment with antibiotics is considered contraindicated in general, as the bacteria produce more toxins under the influence of antimicrobials, which could increase the rate of complications. In most cases, it

suffices to re-establish the body's water and electrolyte balance. Severe cases (e.g. HUS) must be treated in intensive care units via dialysis.

## PREVENTATIVE MEASURES

---

As farm animals and live, wild animals are considered the main reservoirs for these bacteria, adhering strictly to hygiene regulations, such as washing hands after contact with animals, is of utmost importance.

Individuals suffering from a VTEC infection must not be present during the professional processing, treatment or distribution of foods in any way up to the point when the Health Department decides that there

is no more risk that the individuals in question might spread the disease. This is also the case for individuals working in the kitchens of restaurants, cafeterias,

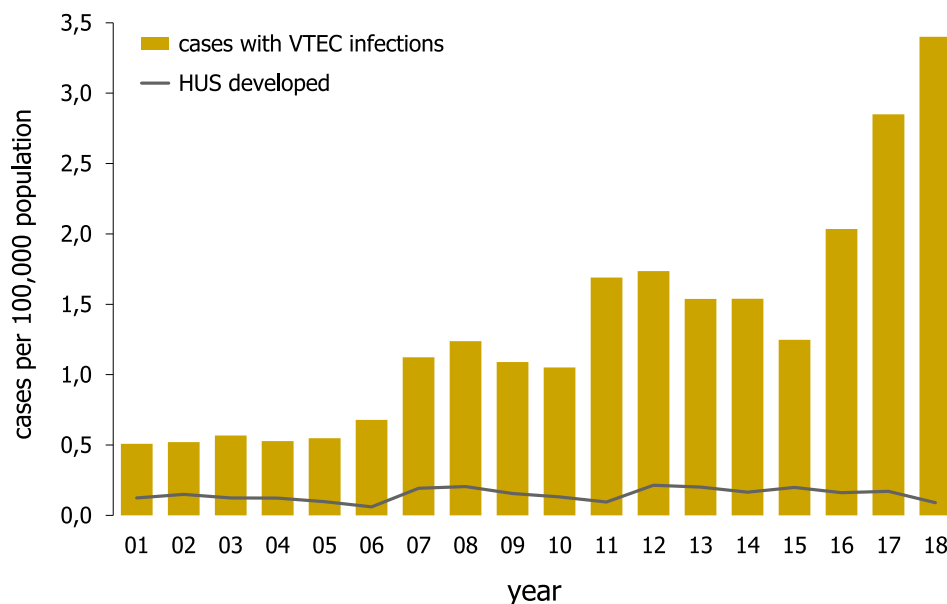
hospitals, baby nurseries, children's homes and in the fields of community catering.

## SITUATION IN AUSTRIA, 2018

### SITUATION IN HUMANS

In 2018, 300 laboratory-confirmed VTEC cases were notified (EMS/NRC-VTEC, as of 4.02.2019). The incidence rate was 3.4/100,000 population, almost a threefold increase compared to 2015 (Fig. 13). This rise in cases can be traced back to the fact that more samples from patients have been tested for VTEC

due to modified reimbursements by health insurance providers since 2016. The serious complication HUS occurred in 8 of these cases, this corresponds with the average during the past few years. Calculated as the proportion of VTEC cases, 30 % of VTEC cases developed HUS in 2002, but only 3 % in 2018.



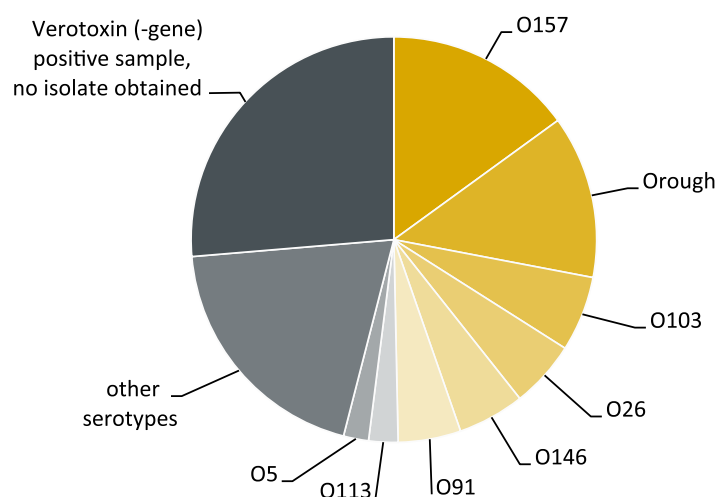
**Figure 13:**

Incidence of VTEC cases and HUS cases in Austria, 2001-2018 (EMS/NRC-VTEC, as of 4.02.2019)

In 79 samples with evidence of a verotoxin or a verotoxin gene, no isolate could be obtained. In 117 of 221 cases with a VTEC isolate (53 %), a serotype could be identified that belongs to that group of serotypes<sup>6</sup> that were identified most frequently in human cases in the EU in 2017. The distribution of the most

frequently identified serotypes is depicted in Figure 14, showing the most common serotype VTEC O157 (45 cases), followed by VTEC Orough (39 cases), which is one of the 20 most frequent serotypes in the EU, and O103 (18 cases).

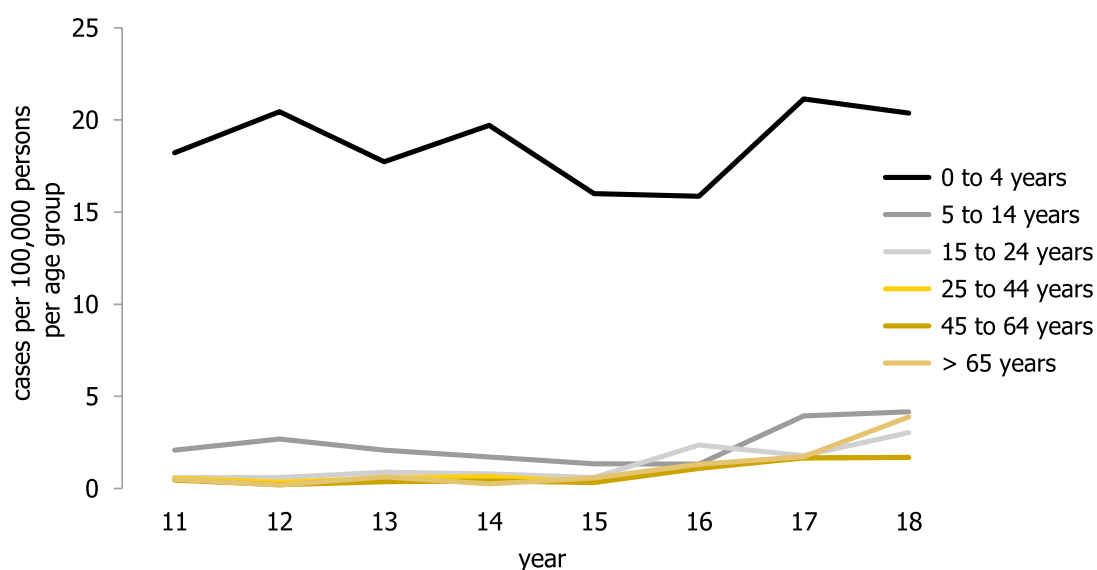
<sup>6</sup> EUSR 2017: most frequent VTEC serotypes as causes for human diseases in the EU in 2017 were O157, O26, O103, O91, O145, O146 und O111

**Figure 14:**

The most common identified VTEC O serotypes in cases in Austria, 2018 (EMS, NRC-VTEC, as of 4.02.2019)

The largest number of cases affected children in the age group from 0 to 4 years, with 20 cases per 100,000 children; in 2018, 30 % of cases were related to that age group, which accounts for 5 % of the total population in Austria. The incidence per 100,000 individuals in all other age groups was between 1.7 and 4.2, depending on the age group (Fig. 15). The same age distribution has been seen during recent years,

in 2018 the incidences in the age groups 5-14, 15-24 and older than 65 adjusted between 3.0 and 4.2 per 100,000 individuals in the respective age group. The high incidence in the youngest age group may be due to higher numbers of samples from patients of this group, especially from children with gastrointestinal symptoms tested targeted for VTEC.

**Figure 15:**

Incidence of VTEC cases notified per age group per 100,000 individuals per age group from 2011-2018 (EMS/NRC-VTEC, as of 4.02.2019)



## COMPARISON AUSTRIA AND THE EU<sup>7</sup>, 2017

In 2017, 6,378 confirmed cases of VTEC infections were reported in the EU. In Austria, the notification rate of 2.9/100,000 population was slightly higher than the EU notification rate of 1.7 cases per 100,000 population. Since 2013, the EU notification rate has been stable at levels between 1.65 and 1.8 per 100,000 population.

The highest country-specific notification rates were observed in Ireland (16.6/100,000), Sweden (5.0), Denmark (4.6), Austria (2.9) and Germany (2.5 cases per 100,000 population), respectively. Nine Member States (Bulgaria, Cyprus, Greece, Latvia, Lithuania, Poland, Portugal, Romania and Slovakia) reported < 0.1 cases per 100,000 population, three of these reported no cases.

In the last five years, Austria, Denmark, Finland, Germany, France, Ireland, Malta, and Spain have reported significant increases in cases, whereas the Netherlands have reported decreases due to a change in notification criteria.

In 15.8 % of cases (844 cases) where information about the country of infection was given, the infection acquired was travel associated, in almost 2/3 of cases outside of the EU. Including the EU, Turkey, Spain, Egypt, Morocco, Italy and Greece were reported most common sources of infection.

As in previous years, the most commonly reported VTEC serogroup in 2017 was O157 (31.9 %), although its relative proportion compared with other non-O157 serogroups declined. This is possibly an effect of increased awareness and of more laboratories testing for other serogroups. Serogroup VTEC O26 was the second frequently isolated type which has increased in the last 3 years. In 2016, for the first time, VTEC O26 was the most frequently reported cause of haemolytic uremic syndrome (HUS) instead of VTEC O157. Although in 2017, VTEC O157 again was confirmed as the most common cause of HUS. The proportion of HUS cases increased by 10 % compared with 2016. Individuals of the age group 0-14 represented 86.6 % of all HUS cases in the EU.

## SITUATION IN FOODS

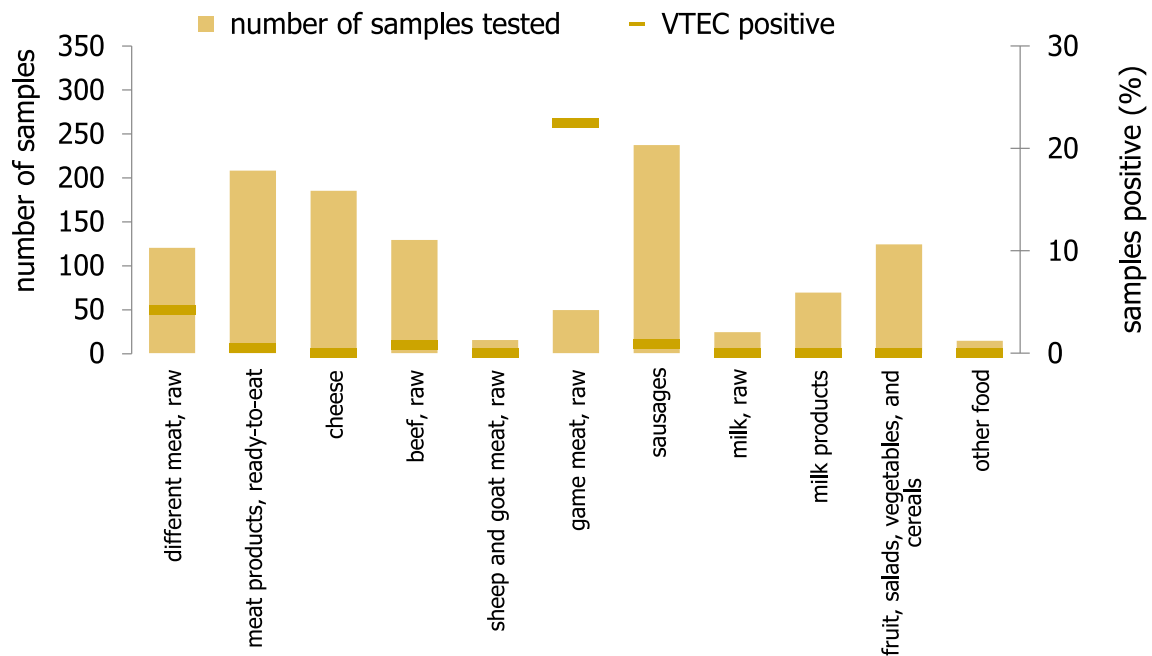
The control and sample plan organised by the BMASGK determines the annual number of companies and foodstuffs to be inspected for each federal province (food producers, food retailers, restaurants etc.). The inspections include various samples and checks on processing methods, among others.

In 2018, 1,147 food samples were tested for VTEC, of which 709 were meat samples (Fig. 16). VTEC were detected in 17 of 313 raw meat samples (5.4 %), mainly in game meat samples (11 of 49 samples, 22.4 %), less frequently in meat samples of livestock (six of 255 samples, 2.4 %). One of 208 samples of ready-to-eat meat products (0.5 %) was contaminated with VTEC and two of 237 tested sausages (0.8 %), of these one of 57 tested raw sausages made from game meat (1.6 %) and one of 180 cured sausages made of mixed meat or meat of unknown

origin (0.6 %). VTEC were not detected in any of the other tested samples, 185 cheeses, of these 129 made from unpasteurised milk, 69 dairy products, 24 samples of raw milk, 124 samples of fruits, vegetables and juices and 14 samples of other meals (Fig. 16).

Typing of the 20 VTEC-isolates revealed 11 different serotypes, two of these causing more frequently diseases in humans in the EU, VTEC O146 and VTEC O91. VTEC O146 was isolated from three samples of fresh game meat and one sample of a fermented sausage (origin of the meat was not documented); VTEC O91 was detected in three samples of fresh meat (one time each beef, game meat and of unknown origin). VTEC O146 is the second frequently serotype causing diseases in Austria was identified five samples of game meat, of these four times in fresh meat and one time in a fresh raw sausage.

<sup>7</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>



**Figure 16:**  
VTEC examinations and results for various foods in Austria, 2018

## SITUATION IN ANIMALS

The BMASGK carries out annual monitoring programmes in Austria in line with the Surveillance Programme Regulation with regards to selected pathogens in bovines, sheep, swine and chickens, in cooperation with official public vets and AGES. A new EU implementation decision came into effect in 2014, which focuses on the monitoring of antimicrobial resistance and this must be implemented by all Member States. Thus, no

monitoring for verotoxin-producing *E. coli* in animals was carried out in 2018. The results of previous testing for VTEC in animals was published in last year's edition of the Zoonoses Report: Report on zoonoses and zoonotic agents in Austria in 2014 (<https://www.ages.at/service/service-oeffentliche-gesundheit/berichte-folder-und-formulare/zoonosenberichte/> ).

# YERSINIOSIS



Yersiniosis is a food-borne infectious disease caused by bacteria of the species *Yersinia* (*Y.*) *enterocolitica* and less frequently by *Y. pseudotuberculosis*.

Electron microscopic image of *Yersinia enterocolitica*

## OCCURRENCE

Enteral yersiniosis is present worldwide and is the third leading bacteriological zoonotic disease in the EU. *Y. enterocolitica* can be found in the environment and in animals - mainly in pigs, but rarely in

dairy cattle and wildlife, and *Y. pseudotuberculosis* in the environment. *Yersinia* has the ability to multiply – similar to *Listeria* – on contaminated food at low temperatures in the refrigerator.

## RESERVOIR

Pigs and, to a lesser extent, dairy cattle are considered as the main reservoirs for pathogenic *Y. enterocolitica*.

## MODE OF TRANSMISSION

In most cases, yersiniosis is transmitted by the consumption of contaminated food, in particular raw or medium done pork and raw or inadequately heat treated milk. In food-borne outbreaks caused by *Y. pseudotuberculosis* in the EU, contaminated vegeta-

bles (sprouts or tofu), untreated water and milk were confirmed as infectious vehicles. Infections rarely occur through nosocomial transmission from human to human.

## INCUBATION PERIOD

Between 3 and 7 days.

## SYMPTOMS

In infants, the disease manifests with gastrointestinal disturbances, whereas adults show signs of appendicitis (pseudo-appendicitis forms). The classical symptoms are diarrhoea, fever and severe abdominal pain (untreated for 1-3 weeks). Diarrhoea may have

watery or bloody quality; after some days, extra-enteric symptoms may develop as reactive polyarthritis, arthralgia, erythema nodosum, and rarely Reiter's syndrome (arthritis, urethritis, conjunctivitis).



## DIAGNOSTICS

---

The symptomatic diversity makes it very difficult to diagnose yersiniosis based only on a clinical picture. Cultures of the bacteria from stool specimens are the method of choice, especially when determining the serotype and biotype of the isolated strain. In non-trea-

ted patients, the bacteria can be shed for weeks after the termination of clinical symptoms. Additionally, molecular biological methods like PCR are used to detect the pathogen.

## TREATMENT

---

Usually, infections with *Y. enterocolitica* and *Y. pseudotuberculosis* are self-limiting; therefore, therapies to re-establish the body's water and electrolyte balance

are enough to ensure recovery. Severe progressive forms justify the use of antibiotics.

## PREVENTATIVE MEASURES

---

Slaughter hygiene is of utmost importance; prevention of consumption of raw pork and pork products and raw milk.

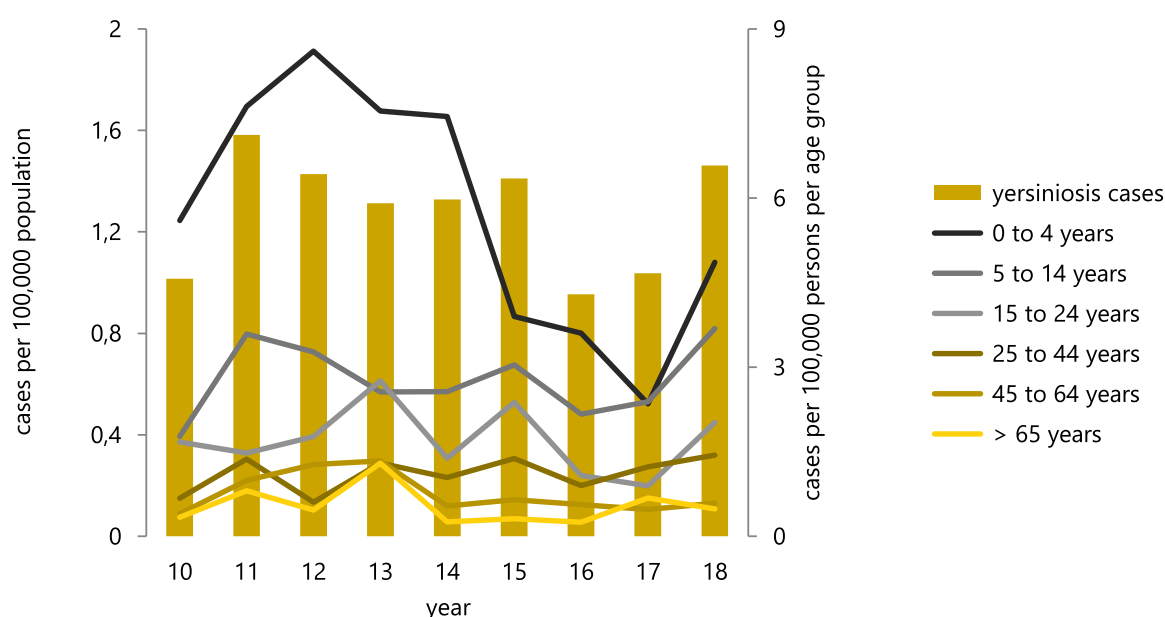


## SITUATION IN AUSTRIA, 2018

### SITUATION IN HUMANS

In 2018, 136 laboratory confirmed cases of yersiniosis were notified (EMS, as of 4.02.2019), the NRC-Y received 130 isolates, 129 were specified as *Y. enterocolitica* and one as *Y. pseudotuberculosis*. The incidence of 1.5 per 100,000 population confirmed an increase of 41 % compared with 2017. The typing of *Y. enterocolitica* revealed serotype O:3 biovar 4 in 87 % of cases, serotype O:9 biovar 2 in 12 % of cases and one iso-

late of serotype O:5,27 biovar 2 and one serotype O:9 biovar 3. Yersiniosis mostly affected children of the age group below 5 years, although a change has been observed in Austria in recent years from 8.6/100,000 in that age group in the year 2012 to 2.3/100,000 in 2017 (Fig. 17). In 2018, a strong rise of cases was observed in the age groups 0-4, 5-14 and 15-24.



**Figure 17:**

Incidence of all cases of notified yersiniosis (columns) and by age groups in Austria, 2010-2018 (EMS, NRC-Y, as of 4.02.2019)

### COMPARISON AUSTRIA AND THE EU<sup>8</sup>, 2017

In 2017, 6,823 confirmed cases of yersiniosis were reported in the EU, therefore *Yersinia* is the third most frequently reported bacterial zoonotic agent in the EU. In Austria, the notification rate was 1.0/100,000 population and lower than the EU-wide incidence of 1.8/100,000, even though this was the lowest rate in the last five years; but the trend cannot be confirmed

as significant. The highest country-specific notification rates were observed in Finland, Lithuania, the Czech Republic, Slovakia and Denmark (7.7 to 3.5 cases per 100,000 population), respectively.

Significant trends in cases can be observed during the last five years, increasing trends in the Czech Repu-

<sup>8</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>



blic, Slovakia, Spain and the UK, decreasing trends in Austria, Estonia, Lithuania and Sweden.

In 7.2 % (248 cases) of all cases with known country of infection, the infection acquired was travel related, half of those cases in the EU (most frequently in Spain, Italy and Greece) and half outside of the EU

(most frequently Cuba and Thailand). *Y. enterocolitica* caused 99.3 % of human cases when species information was given, the rest were caused by *Y. pseudotuberculosis*. For 56 % of the isolates, Member States provided information about the *Y. enterocolitica* serotypes: the most common was O:3 (87 %), followed by O:9 (9 %) and O:5,27 (2 %).

---

#### **SITUATION IN FOODS**

---

In 2018, no sample was examined for the presence of *Yersinia*.

---

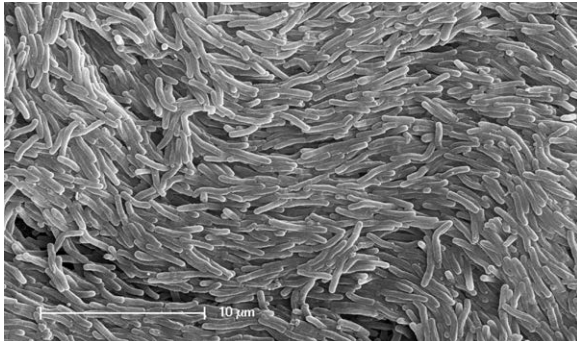
#### **SITUATION IN ANIMALS**

---

In pigs, which are considered as the main reservoir for *Y. enterocolitica*, sporadically bloody diarrhoea can be found, in young animals arthritis and pneumonia.

However, in most cases infections are asymptomatic and remain unnoticed by the farmer.

# TUBERCULOSIS CAUSED BY *MYCOBACTERIUM BOVIS*



Electron microscopic image of *M. caprae*

Tuberculosis (Tb, consumption) leads global statistics on fatal, human infectious diseases, the pathogens of which belong to the *Mycobacterium tuberculosis* complex (MTC). The most common human tuberculosis pathogen is *Mycobacterium (M.) tuberculosis*, an immobile, rod-shaped bacterium. *M. bovis* and *M. caprae* are found less regularly in humans.

## OCCURRENCE

Tuberculosis, mainly caused by *M. tuberculosis* is spread globally, with clusters in Africa, Asia and Latin America. People with close contact to patients with open or active tuberculosis (i.e. infectious) have a high risk of infection. An alarming increase in tuberculosis cases with multidrug resistant (at least not susceptible to the two anti-mycobacterial drugs isoniazid and rifampicin) strains has been documented over recent years.

After World War II, the causative agent of bovine tuberculosis could be eradicated from susceptible livestock in many European countries due to strict control programmes, thus they gained official tuberculosis-free status.

The bacterium can be deactivated by pasteurisation (heat to 72 °C for a short time); however, it is not affected by dehydration or cold.

## RESERVOIR

Humans are the only relevant reservoir for *M. tuberculosis*. The reservoirs for zoonotic mycobacteria *M. bovis* and *M. caprae* are cattle, wild boar, goats or wild ruminants (mainly red deer).

Austria's cattle livestock was awarded the status "officially tuberculosis free (*M. bovis*)" (OTF) by the EU in 1999 and this has been confirmed every year since that date. This tuberculosis bacterium has not been detected in any Austrian cattle since then.

Cases of tuberculosis in red deer caused by *M. caprae* have been documented repeatedly in certain regions in the Austrian provinces of Tyrol and Vorarlberg in

recent years. As a result, *M. caprae* infections were also detected in cattle grazing on alpine pastures, due to overlapping pasture and grazing areas for cattle and deer.

To determine the situation in the cattle population, specific risk areas (Sonderuntersuchungsgebiete und Sonderüberwachungsgebiete) have been defined in certain parts of Tyrol and Vorarlberg for several years and the cattle in these areas have been tested for tuberculosis using the simultaneous tuberculin test (intracutaneous test) after/before transhumance season.





## MODE OF TRANSMISSION

Factors such as the quantity and intensity of contact, the number of pathogens inhaled or ingested and the overall condition of the individual in question determine whether there will be an infection or not. Infection is caused predominantly by inhaling aerosol droplets released from a patient suffering from active tuberculosis via coughing or sneezing. Tuberculosis manifests itself as pulmonary tuberculosis in 80 % of patients, but can affect any organ of the body. Open or active pulmonary tuberculosis is a disease in which the pathogens can be detected in the individual's

sputum or phlegm. Transmission by the consumption of raw (unpasteurised) milk from infected cattle to humans is possible in principle, although in recent decades no cases of intestinal tuberculosis with an infection source in Austria have been identified. Since the occurrence of *M. caprae* in certain regions of Tyrol and Vorarlberg, this transmission route can no longer be excluded and corresponding control measures have been adapted (also see chapter "[Situation in Animals](#)").

## INCUBATION PERIOD

The period from infection to the outbreak of the disease can take from a few months – in particular in

infants – up to several years and even decades.



## SYMPTOMS

Within 3-6 weeks following airborne infection, small foci of inflammation form in the lungs in response to the presence of bacteria; these lesions develop into small encapsulated lumps (tubercles). This form is referred to as non-infectious tuberculosis; it is not contagious because no pathogens are emitted. An active case of tuberculosis starts with general symptoms like night sweats, including fever, fatigue, loss

of appetite, weight loss, and general malaise. If the respiratory tract is affected, caverns can be formed; breathlessness and coughing up blood are symptomatic for respiratory involvement and patients are highly contagious. Miliary tuberculosis occurs when the bacteria spread into the lungs and other organs via the bloodstream. In such cases, tuberculous meningitis can develop.

## DIAGNOSTICS

**Tuberculin skin test:** a tuberculin skin test in line with the Mendel-Mantoux method can be carried out to detect an infection. To do this, the immune reaction to the pathogenic components injected are tested. The test already can yield positive results six weeks after infection and before symptoms occur. This skin test is being increasingly replaced by the so-called interferon  $\gamma$  release assay (IGRA), a blood test.

**Imaging methods:** characteristic images of a lung infection can be illustrated using X-ray diagnostics. An X-ray does not exclude other lung diseases from a differential diagnostic perspective. Thus, the diagnosis is usually backed up through a combination of several other examination methods.

**Bacteriological diagnostics:** detecting nucleic acids provides a first diagnosis within a few hours. The time-consuming cultivation of mycobacteria will confirm the tuberculosis diagnosis. The advantage of growing cultures is the possibility to test the mycobacteria's susceptibility to specific antimicrobials (resistance testing). The isolates obtained are typed on a molecular biological basis.

**Molecular biological diagnosis:** To comply with the newest standards, samples are analysed using whole genome sequencing (WGS) techniques. This helps to identify matching strains and trace back sources of infections from an epidemiologic perspective. Additionally, WGS delivers results on the presence of resistance genes and facilitates species identification within the *Mycobacterium tuberculosis* complex.

## TREATMENT

Therapy takes several months and the risk of mycobacteria developing antimicrobial resistances is very high as the bacteria are difficult to reach in the tuberculous granuloma with medication. As a result, patients with confirmed tuberculosis must be treated

with a combination therapy of several specific antibiotics, so-called anti-mycobacterial drugs. Thus, the time over which these drugs must be administered is long (over months) to avoid a possible relapse.



## PREVENTATIVE MEASURES

The most important measure is to identify infected individuals as quickly as possible and treat them, as there is no effective vaccine for tuberculosis. Once tuberculosis has been diagnosed, an active search for

other, potentially infected individuals in the environment of the patient (index case) is crucial to mitigate new infections.

## SITUATION IN AUSTRIA, 2018

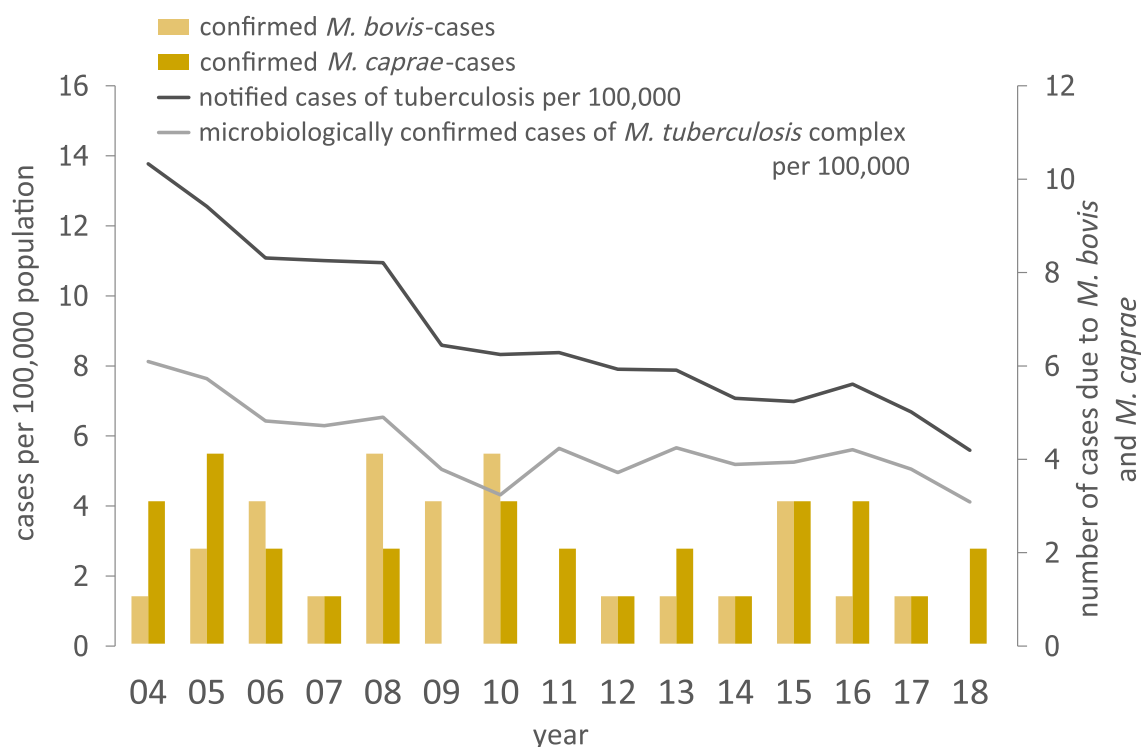
---

### SITUATION IN HUMANS

---

In 2018, 479 confirmed human tuberculosis cases were notified to EMS (as of 21<sup>st</sup> March 2019). That corresponds to 5.4 cases per 100,000 population and a decrease of 91 cases compared to 2017. Of these, 351 cases were confirmed microbiologically as MTC

cases (NRC-Tb, as of 5.04.2019). Two cases were infected with *M. caprae*, *M. bovis* was not detected (Fig. 18). Both *M. caprae* cases were associated with the tuberculosis in animals in Vorarlberg.

**Figure 18:**

Tuberculosis cases per 100,000 population notified and microbiologically confirmed and cases caused by *M. bovis* and *M. caprae* in Austria, 2004-2018 (EMS, as of 21.03.2019, NRC-Tb, as of 5.04.2019)

## COMPARISON AUSTRIA AND THE EU<sup>9</sup>, 2017

In 2017, 185 confirmed cases of *M. bovis* were reported, this corresponds to 0.4 % of all notified tuberculosis cases. The *M. bovis* cases were reported from 12 EU Member States, 15 MS did not report any case. In Austria, the incidence of *M. bovis* cases was 0.01/100,000 population, lower than in the EU (0.04/100,000). The annual EU incidence rates of 0.03 per 100,000 population did not show changes in the last few years.

The cattle population of the following countries is "officially tuberculosis free" (OTF) at present: Austria, Belgium, the Czech Republic, Denmark, Estonia,

Finland, France, Germany, Hungary, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Slovakia, Slovenia, Sweden and several provinces in Italy and Portugal's Algarve region, as well as Scotland and the Isle of Man within the United Kingdom, and Norway, Switzerland and Liechtenstein. In OTF countries, the incidence of human *M. bovis* cases was 0.03 per 100,000 population, in non-OTF countries similar at 0.05/100,000. The highest country specific notification rates came from Spain (0.12/100,000 population) and the Netherlands and UK (both 0.06/100,000 population).

<sup>9</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>

---

## SITUATION IN FOODS

---

There were no cases of *M. bovis* found in 2018 in the course of the slaughter of bovines, confirming the country's official status as "free of bovine tuberculo-

sis",— according to national and EU legislation – and in the course of the slaughter of sheep, goats and pigs.

---

## SITUATION IN ANIMALS

---

Bovine tuberculosis is a notifiable animal disease in Austria. Austria has been considered "officially free" of bovine tuberculosis since 1999 in line with the Commission Decision No. 467/1999/EC. The nationwide examination of ruminants using intracutaneous tests has been halted since May 2000; the monitoring of the disease is carried out as part of the ante-mortem and post-mortem inspections of slaughter animals. However, since 2008 there has been a spillover of *M. caprae* from red deer to cattle in some areas of Tyrol and Vorarlberg as a result of the sharing of the same grazing areas/pastures. To determine the situation in these areas, special inspection and surveillance areas (Sonderuntersuchungs- und Sonderüberwachungsgebiete, in line with the national regulation on bovine tuberculosis) are defined every year. In these areas, cattle are tested for tuberculosis (intracutaneous test) before and after the transhumance season. These areas are adapted to the observed epidemiological situation and, if applicable, appropriate adjustments of the areas are made.

In 2018, 20,633 bovine animals in 1,835 holdings were tested using intracutaneous tests in the special inspection and surveillance areas and 11 bovines

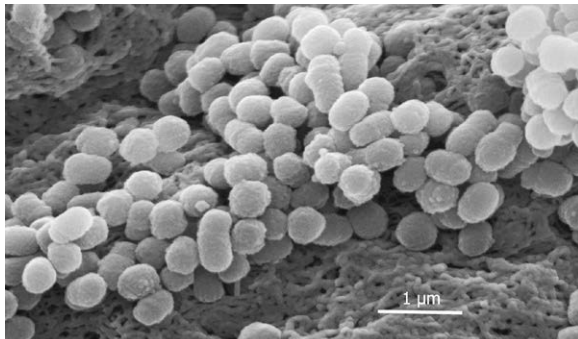
from three holdings were identified as being infected with *M. caprae*. *M. bovis* could not be detected at all. Bovine tuberculosis (*M. caprae*) was detected in one slaughtered animal in terms of the ante-mortem and post-mortem inspections.

An eradication area for tuberculosis in red deer was defined and established in Tyrol in 2011 for the first time, on the legal basis of the national "Red Deer – Tuberculosis Regulation". In this eradication area (district of Reutte), a total of 242 red deer were tested and the infection was confirmed in six in the hunting year 2018. In the "screening area" (certain hunting grounds in the districts of Schwaz, Innsbruck-Land, Landeck, Reutte, and Kufstein), 369 hunted red deer were examined and infections confirmed in eight animals.

The federal province of Vorarlberg has been conducting a red deer tuberculosis monitoring programme since 2009; an eradication area was established in the district of Bludenz in 2013. In the hunting year 2018, a total of 763 hunted red deer were examined in terms of the Vorarlberg-wide monitoring and infections with *M. caprae* confirmed in 27 animals.



# BRUCELLOSIS



Electron microscopic image *Brucella* sp.

Brucellosis is a disease caused by the bacteria genus *Brucella* (*B.*). Most important species are *B. melitensis* and *B. abortus*, rarely *B. suis*.

## OCCURRENCE

The species *B. melitensis* occurs predominantly in sheep and goats in Mediterranean regions. When humans are infected, it is referred to as Malta fever.

*B. abortus* causes epizootic miscarriages in cattle and Bang's Disease in humans. *B. suis* is rare in Europe and is found mainly in hares, in addition to swine.

## RESERVOIR

Infected livestock (cattle, goats, sheep, swine), hares

## MODE OF TRANSMISSION

The disease is mainly transmitted to humans via food contaminated with *Brucella* (unpasteurised milk and products made from this) or directly via contact with infected animals and their excreta. Direct transmission between humans is very rare (only in individual cases via breastfeeding or blood transfusions).

Austria's cattle population has been officially free of *B. abortus* since 1999 and the sheep and goat population has been officially free of *B. melitensis* since 2001. As a result, the infection risk is very low in Austria.

## INCUBATION PERIOD

In general, between 5 and 60 days.

## SYMPTOMS

Up to 90 % of all infections progress sub-clinically; they are only recognised by detecting specific antibodies in the patients and are an expression of a successful immune reaction. Acute brucellosis, on

the other hand, includes unspecific symptoms such as fatigue, slight fever, headaches and arthralgia in its early stage. After a brief symptom-free interval, this may be followed by influenza-like symptoms, combi-



ned with temperature increases of up to 40 °C in the evenings and massive sweats, often in combination with low blood pressure and swellings of the liver,

## DIAGNOSTICS

Blood samples should be taken repeatedly – ideally before the start of any therapy with antibiotics – to detect the bacteria by culture; bone marrow, urine and other tissue samples are also suitable for the

spleen and lymph nodes. The disease may subside without antibiotic treatment, but may become chronic with recurrent fever without therapy.

cultivation of the pathogen. Multiplex PCR is used for species identification. In addition, serological tests for specific antibodies are also useful diagnostics.

## TREATMENT

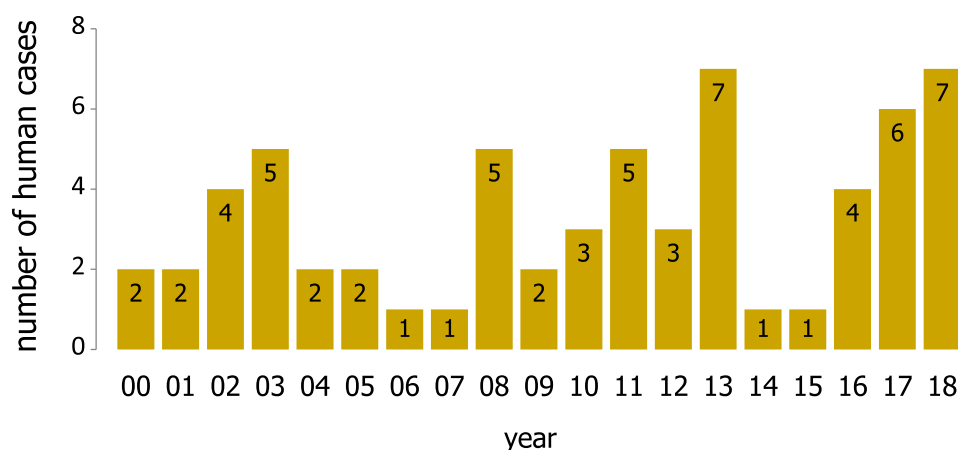
Treatment with antibiotics.

## SITUATION IN AUSTRIA, 2018

### SITUATION IN HUMANS

Brucellosis is only found sporadically as a human infectious disease in Austria. In 2018, seven laboratory-confirmed cases were documented (EMS/NRL-brucellosis, as of 14.01.2019, Fig. 19). *B. melitensis* was specified in all cases. Five cases, four of which

showed clinical symptoms (notified in the EMS), were associated with an outbreak of brucellosis at a dairy farm in Upper Austria (see chapter Situation in animals). The other cases were reported as imported.



**Figure 19:**  
Number of human brucellosis cases, 2000-2018 (from 2009 EMS/NRL-B, as of 14.01.2019)

### COMPARISON AUSTRIA AND THE EU<sup>10</sup>, 2017

In 2017, 278 confirmed cases of brucellosis were reported in the EU, a decrease in cases of 29 % compared with 2016, which had a total of 530 cases and was the highest number in recent years. In Austria, the incidence was 0.05 per 100,000 population and lower than the EU incidence of 0.09/100,000.

Greece (0.87/100,000), Italy (0.16), Portugal (0.16) and Spain (0.14/100,000) reported the highest incidences and their numbers counted for 72 % of all cases in the EU; the bovines and small ruminants of these countries have not been awarded with the status "officially brucellosis free" (nonOBF), respecti-

vely officially *B. melitensis* free (nonOBmF). OBF and OBmF countries reported the lowest rates in humans and most of their cases were travel associated. For Greece, a significant downward trend in cases have been observed in the last five years, upward trends were not seen in the EU MS.

Forty-six of the 54 travel-associated cases (85 %) with the possible country of infection given were outside the EU, in Iraq, Turkey and Syria. The other eight cases acquired the infection in Greece, Italy, Romania, Bulgaria and France.

<sup>10</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>

---

## SITUATION IN FOODS

---

Food is not tested for *Brucella*, as the Austrian ruminant population is OBF and OBmF since 1999 and

2001, respectively. Livestock is examined for *Brucella* annually, according to a risk-based sampling plan.

---

## SITUATION IN ANIMALS

---

Austria's disease free status has to be confirmed via surveillance programmes in the relevant animal

populations every year to retain the country's OBF and ObmF status.

### Bovine brucellosis

In 2008, a new regulation on testing for Bang's disease came into effect. Bulk milk tests were used in a nationwide surveillance programme for all dairy cow farms and blood examinations according to a risk-based sampling plan up to 2012. Since 2013, selected bulk milk samples from dairy farms have been examined for *B. abortus* antibodies according to a risk-based plan: in 2018, bulk milk samples from 2,704 farms were tested. Serologically non-negative bulk milk samples are verified by the testing of blood samples. In terms of non-dairy cattle farms, 11,305 blood samples were tested at 1,503 holdings, according to the risk-based sampling plan and in connection with investigations into a human case of *B. melitensis*. Reactors were identified at two holdings with contacts to the human case. Additionally, 1,082 bovines were sampled as part of the epidemiological investigations. Five miscarriages from 551 miscarriages that occurred in the serological positive holding were caused by *B. melitensis*.

Details about the outbreak: In June 2018, brucellosis due to *B. melitensis* was confirmed in a large dairy farm in Upper Austria. Since January, miscarriages and fatal cases in calves have occurred in that holding. Further examinations identified one bovine infected with *B. melitensis* at a second holding. An epidemiological relation between the two holdings could be determined. The disease was controlled according to legislation and concentrated on the identification, isolation and culling of the affected animals, and controlling of animal movements to prevent the further spread of the pathogen, as well as epidemiological and environmental investigations. It was not possible to clarify completely how *Brucella* was introduced into the holdings. Consumers were not at risk of acquiring the disease at any time because all the milk delivered from that holding was pasteurised in a dairy plant prior to distribution.

### Brucellosis in sheep and goats (caused by *B. melitensis*):

To retain its OBmF status every year, evidence has to be provided that less than 0.2 % of Austria's sheep and goat populations are infected with *B. melitensis*. In 2018, blood samples from 21,133 sheep and goats originating from 1,719 herds across Austria were

tested, according to a risk-based sampling plan. These numbers also included examinations in relation to the above-mentioned outbreak of *B. melitensis* in bovines. No cases of brucellosis in sheep and goats were identified.

# TRICHINELLOSIS



Light microscopy image of larvae of *T. britovi* after digestion of muscle

Trichinellosis is caused by the larvae of roundworms – in particular, the species *Trichinella spiralis*. The agent is referred to as trichinella or trichina worm. The last autochthonous, food-borne outbreak occurred in 1970 after the consumption of smoked meat from a domestic pig that was fed with *T. spiralis* infested fox carcasses.

## OCCURRENCE

Trichinellosis is a mammalian zoonosis that is prevalent globally and occurs under no specific climatic conditions. Humans are considered an incidental host, as the infestation is not passed on to others. Trichinel-

losis is rare in Central Europe; the incidence levels in the eastern EU Member States are higher (see below, EU average). In wildlife, *T. britovi* is identified in addition to *T. spiralis*.

## RESERVOIR

Wild boars, domestic pigs, and horses are intermediate hosts. Rodents and foxes are considered reservoirs. Swine are definitive hosts.

## MODE OF TRANSMISSION

Infestation occurs by consuming raw or undercooked meat that contains encysted *Trichinella* larvae. The larvae are set free by digestive enzymes and reach maturity in the mucosa cells of the small intestine, where they develop into small worms. Females start to release up to 1,500 larvae within four to seven days after being ingested by the host. The young

larvae pass through the wall of the small intestine and migrate to the muscle tissue via the host's blood vessels, where they encyst and are able to survive for several years. Muscles that are well supplied with blood and oxygen, such as the diaphragm, neck and chewing muscles, shoulder muscles or upper arms, are preferred tissues.

## INCUBATION PERIOD

The incubation period is 5 to 15 days and depends on the number of *Trichinella* larvae ingested. There are different opinions on the number of *Trichinella* larvae that must be ingested to result in clinical infestation in

humans – over 70 larvae will most likely trigger diseases. Transmission between humans is not possible.





## SYMPTOMS

The severity of the disease depends on the number of larvae ingested and the individual's immune reaction. Higher numbers of larvae ingested may lead to diarr-

hoea, vomiting and gastrointestinal conditions within the first week. This may be followed by high fever, chills, swollen eyelids, headaches and muscle pains.

## DIAGNOSTICS

A tentative diagnosis can be confirmed by testing for specific antibodies in the patient's blood. In the case

of a massive infestation, larvae might even be detected histologically in the tissue.

## TREATMENT

Patients with mild symptoms recover without complications through resting and taking painkillers. Severe

infestations are treated by anthelmintic medication.

## PREVENTATIVE MEASURES

Heat of over 70 °C destroys the larvae. Deep-freezing at minus 15 °C reduces the parasite's infectiousness;

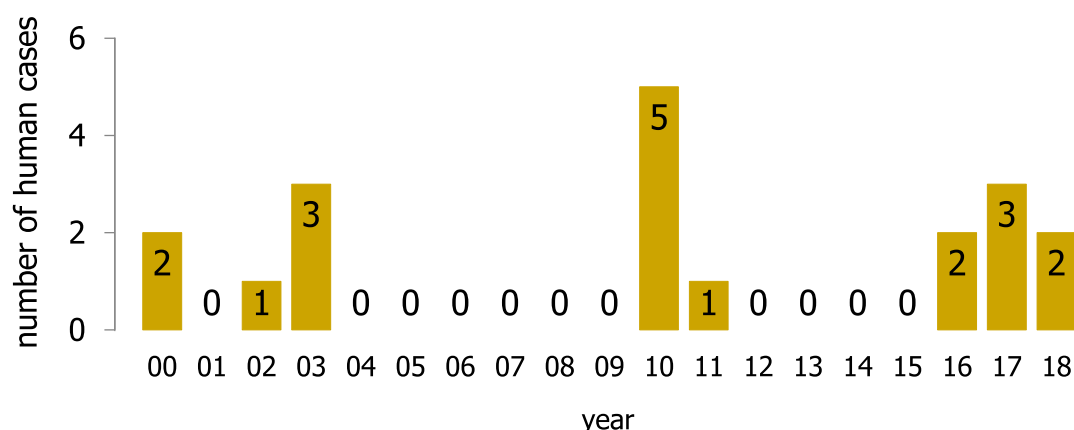
smoking, curing and drying are not suitable ways of destroying the larvae.

## SITUATION IN AUSTRIA, 2018

### SITUATION IN HUMANS

All the cases of trichinellosis reported in the past three decades were imported. In 2018, two cases of human trichinellosis were notified in Austria (EMS, as of

17.01.2019, Fig. 20). According to the information in the EMS, one case was acquired abroad, the place of infection in the second case is unknown.



**Figure 20:**

Human trichinellosis cases in Austria, 2000-2018 (EMS, as of 17.01.2019; prior to 2010: data from the NRC toxoplasmosis, echinococcosis, toxocarosis and other parasitoses)

### COMPARISON AUSTRIA AND THE EU<sup>11</sup>, 2017

In 2017, 168 confirmed cases of trichinellosis were reported in the EU. In Austria, the incidence was the same as for the whole EU at 0.03 per 100,000 population. That represents an increase of 50 % in the EU compared with 2016. However, since 2013, a significant decrease in the number of cases can be observed in the EU.

Cases in Bulgaria, Croatia, Lithuania and Romania accounted for 79 % of all confirmed cases in the EU. No trichinellosis cases were notified from 13 Member States and of these Cyprus, Finland, Luxembourg and

Malta have never reported a case of trichinellosis. Romania and Latvia observed significant decreases in the number of cases, no increases were detected in any MS.

Most cases (98 %) with known travel status were acquired in their own country. The *Trichinella* species was reported in 40.5 % of cases, *T. spiralis* caused approximately half of the cases, *T. britovi* the other and *T. native* only a few cases. *T. britovi* was confirmed in all cases in Bulgaria.

<sup>11</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>



---

## SITUATION IN FOODS

---

The following slaughter animals were tested for *Trichinella* as part of mandatory meat inspections in Austria in 2018: 5,123,942 domestic pigs, 618 horses, 15,074

free-range wild boars and 993 farmed wild boars. None of these carcasses tested positive for *Trichinella*.

---

## SITUATION IN ANIMALS

---

Swine held on sties or in buildings are considered *Trichinella* free because the animals do not have the opportunity to consume infested fresh meat. The practicality of mandatory *Trichinella* inspections for

domestic pigs has been questioned critically by the EFSA. Wild boars, on the other hand, must be considered as potentially harbouring trichinae.



# ECHINOCOCCOSIS



Echinococcosis is a disease caused by the metacystode stage larvae of the tapeworm species *Echinococcus*. The two forms present in Europe are the fox tapeworm, *Echinococcus (E.) multilocularis*, the agent of alveolar echinococcosis, and the dog tapeworm, *E. granulosus*, the cause of cystic echinococcosis.

Light microscopy image of *E. multilocularis*

## OCCURRENCE

The fox tapeworm *E. multilocularis* is prevalent in Austria, France, Germany, northern Italy and Switzerland. It is found in about every third to fourth fox on average in Bavaria and northern Tyrol, almost in every second fox in Vorarlberg. The United Kingdom,

Norway, Finland, Malta and Ireland are officially *E. multilocularis* free. *E. granulosus* has global prevalence, clustering in Europe in the Mediterranean region and the Balkan countries. In Austria, *E. granulosus* is considered as being extinct.

## ERREGERRESERVOIR

*E. multilocularis*: intermediate host: small rodents  
definitive host: fox

*E. granulosus*: intermediate host: sheep, swine, cattle  
definitive host: dog

## MODE OF TRANSMISSION

**Fox tapeworm:** the 2-3 mm long, five-segmented worms are found in the small intestines of foxes. Cats and dogs are only rarely infested. Every 1-2 weeks, the final segment of each tapeworm, which contains up to 500 eggs, detaches and is released into the environment via the host's faeces. If the appropriate intermediate host (rodents) ingests tapeworm segments, the eggs hatch and release larvae, invading the host's intestinal mucosa and reach via the blood stream inner organs, especially the liver. In humans, who are incidental hosts, growth is slow, resulting in the invasion of the surrounding tissues similar to a malignant tumour, called alveolar cysts and the disease alveolar echinococcosis.

**Dog tapeworm:** the 3-6 mm long adult worms reside in the small bowel of the definitive hosts, dogs or other canids. Every two to three weeks, gravid proglottids (segments of the worm) containing up to

1,500 eggs are released via faeces into the environment. After ingestion by a suitable intermediate host (under natural conditions: sheep, goats, swine, cattle) through grazing, the egg hatches in the small bowel and releases an oncosphere (larva) that penetrates the intestinal wall and migrates through the circulatory system into various organs, especially the liver, heart, spleen and lungs. In these organs, the oncosphere develops into a hydatid cyst that enlarges gradually, producing protoscolices (small heads) and daughter cysts that fill the cysts' interior. The definitive host becomes infested by ingesting the cyst-containing organs of the infested intermediate host, developing new adult tapeworms. In humans and intermediate hosts the disease is called cystic echinococcosis. Humans may become infected via smear infection by accidental ingestion of tapeworm eggs present on food contaminated with faeces of affected foxes or dogs.



## INCUBATION PERIOD

Alveolar echinococcosis:	5-15 years
Cystic echinococcosis:	Months to years

## SYMPTOMS

**Alveolar echinococcosis:** the most common symptoms are abdominal pains and jaundice, sometimes fatigue, weight loss or an enlarged liver – caused by the invasive and tumour like growth of the cysts.

**Cystic echinococcosis:** often cause pain in the right upper abdomen due to larval parasites grow large enough (cysts size up to 30 cm in diameter) in the liver; if the lung is affected, breathing difficulties and coughing appear.

## DIAGNOSTICS

Imaging methods such as ultrasound, chest x-rays or CT scans can produce visual images of the differently structured – and often calcified – changes in the tissue. A special antibody detection method is used on the patient's blood samples to verify a tentative

diagnosis and identify the *Echinococcus* species. A negative serological result does not exclude an infestation. Histologically, the diagnosis can be confirmed in surgical material.



## THERAPY

The goal of the treatment is the complete surgical removal of the parasitic tissue. However, this is often (almost) impossible at an advanced infestation stage. As a result, therapy includes a combination of surgery and the administering of medication.

**Cystic echinococcosis:** the so-called PAIR technique can be performed: puncture (of the cyst under ultra-sonic control), aspiration, injection (of a scolicedal agent), and re-aspiration (of the cyst's content) together with anthelmintic therapy.

## PREVENTATIVE MEASURES

*Echinococcus* eggs have a relatively high resistance to cold and can, therefore, remain infectious for several months. However, dryness and high temperatures destroy them within a short period of time. The following preventative measures should be taken to avoid

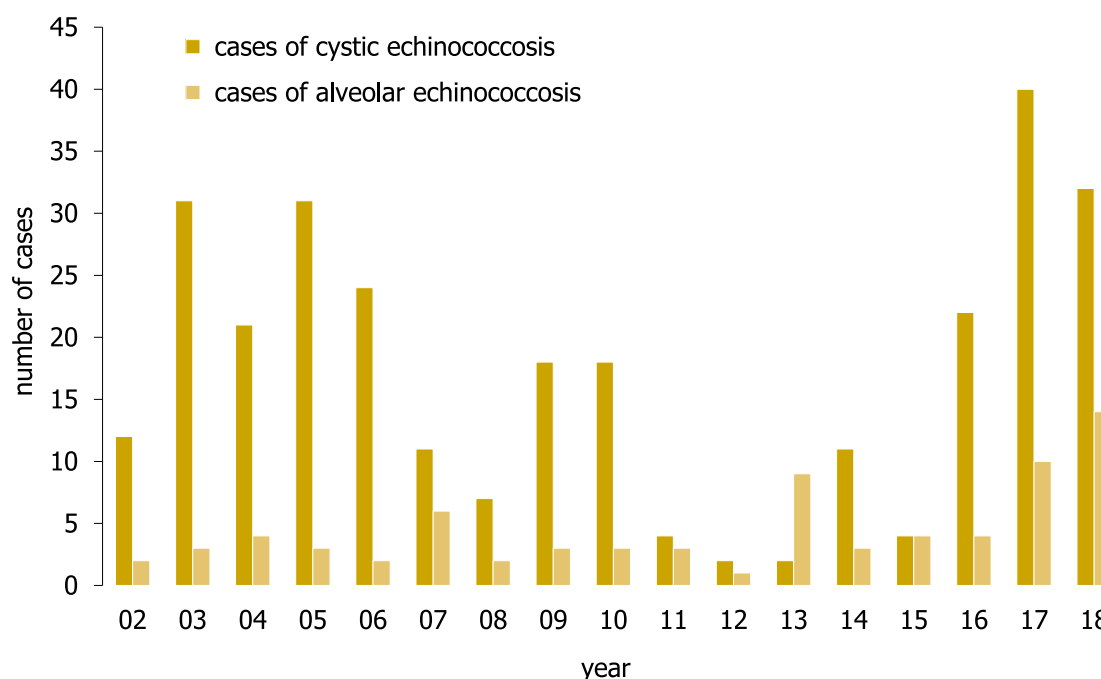
*E. multilocularis* infestations: washing hands with soap and warm water after contact with foxes or fox fur. Dogs should be de-wormed on a regular basis and not be fed offal from contaminated sheep to avoid infestations with *E. granulosus*.

## SITUATION IN AUSTRIA, 2018

### SITUATION IN HUMANS

**Alveolar echinococcosis:** in 2018, 14 cases were notified to EMS (as of 14.01.2019, Fig. 21). Two cases in non-Austrian citizens count as imported, the other cases affected Austrians infested in Austria, four of these in Tyrol and three in Vorarlberg. The incidence in Austrian citizens is 0.16 per 100,000 population.

**Cystic echinococcosis:** in 2018, 32 cases were notified to EMS (as of 14.01.2019, Fig. 21). Six cases were Austrians, two of these infested in Austria, the place of infestation is not known in the other cases. The incidence is 0.36 per 100,000 population.

**Figure 21:**

Number of human echinococcosis cases (cystic and alveolar) in Austria, 2002-2018 (EMS, as of 14.01.2019; prior to 2010: data from the NRC toxoplasmosis, echinococcosis, toxocarosis and other parasitoses)

## COMPARISON AUSTRIA AND THE EU<sup>12</sup>, 2017

Even if human echinococcosis is notifiable in some Member States, in practice, these parasitic diseases are largely underreported in Europe. In 2017, 827 confirmed human echinococcosis cases were reported in the EU. In Austria, the incidence (0.57 cases per 100,000 population) was higher than the EU average notification rate of 0.19 cases per 100,000 population, a decrease of 14 % compared with 2016. Bulgaria (3.07), Lithuania (1.86) and Austria (0.57 per 100,000 population) reported the highest number of cases in the EU. Despite the high incidence in Bulgaria, it was the lowest level there since 2013.

In 555 cases, the *Echinococcus* species was reported. Alveolar echinococcosis was differentiated in 146 cases (26 %); this number equates to an increase of 50 % compared with 2016 and an EU-wide incidence of 0.034 per 100,000 population. This increase mainly

can be traced back to a higher number of notified cases in France, Lithuania and Poland.

Finland, Ireland, Malta, the United Kingdom and Norway retained their official status free of *E. multilocularis*, which they achieved in 2011.

Cystic echinococcosis: almost three quarters of the differentiated echinococcosis cases were caused by *E. granulosus*, Bulgaria reported more than more of half of these. Since 2013, Slovakia and Spain have registered significant drops in numbers of cases, while Austria, Finland, Germany, Lithuania and Poland have recorded increases. The incidence in the EU was 0.094 per 100,000 population.

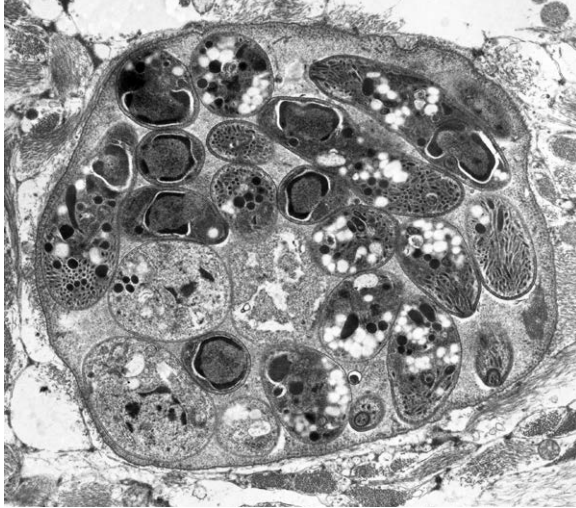
In three quarters of cases, no information was available concerning the possible country of infection or travel association given.

## SITUATION IN ANIMALS

Dogs are generally considered free of *E. granulosus* infestation in Austria.

<sup>12</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>

# TOXOPLASMOSIS



Toxoplasmosis is caused by the obligate intracellular, parasitic protozoa *Toxoplasma* (*T.*) *gondii*. As part of a primary infection followed by parasitaemia (presence of parasites in the blood) during pregnancy, *Toxoplasma* may be transmitted to the unborn child via the bloodstream diaplacentally (congenital infection). About half of all toxoplasmosis cases are considered food-borne.

Electron microscopic image of a cyst filled up with *T. gondii*

## VORKOMMEN

Infections with *T. gondii* are prevalent in humans and animals on a worldwide basis, with almost all warm-blooded creatures, including humans, being

potential intermediate hosts. Cats and other felines are definitive hosts.

## PATHOGEN RESERVOIR

**Definitive hosts:** the parasite only reproduces sexually in cats and other felines. If cats eat contaminated rodents or birds are fed raw meat containing *Toxoplasma* cysts, the parasites go through a sexual reproduction cycle in the animal's intestinal tract and are shed as oocysts in the faeces.

**Intermediate hosts:** the spectrum of potential intermediate hosts, which can be infected by oocysts or by ingesting muscle or brain tissue containing cysts, includes humans, sheep, goats, rodents, swine, cattle, chicken and birds.

## MODE OF TRANSMISSION

Intermediate hosts, including humans, are infected by orally ingesting oocysts as part of any direct contact with infected cats or by consuming food contaminated by cat faeces, as well as via the oral ingestion of cysts present in the tissue of an intermediate host (e.g. undercooked mutton).

*Toxoplasma* may be transmitted to the unborn child via the bloodstream diaplacentally, as part of a primary infection followed by parasitaemia (presence of parasites in the blood) during pregnancy.

## INCUBATION PERIOD

10 to 23 days following the consumption of cysts in raw meat or 5-20 days following the consumption of oocysts (e.g. via vegetables contaminated with cat faeces).





## SYMPTOMS

Healthy adults rarely show visible symptoms or have uncharacteristic symptoms when infected with *T. gondii*. An infection is eventually followed by the forming of *Toxoplasma* cysts in the tissue – in particular in the brain, retina, heart and skeletal muscles – as a result of an immune reaction in which they can survive many years and pose a latent, lifelong infection source.

The probability of a congenital *Toxoplasma* infection as part of the primary infection of pregnant women depends on the point of time that the infection occurs during pregnancy. The later the infection, the higher the probability is that the pathogen will reach the foetus via the placenta. However, the severity of the infection in the child is inversely proportional to this: an infection during the first trimester will cause

the foetus to die in the majority of cases. A clinical manifestation in the foetus reaches its peak following the primary infection of the future mother during the second trimester, mostly with hydrocephalus, calcifications in the brain or serious eye damage. An infection during the last trimester often results in babies born with no visible clinical symptoms. However, long-term complications and damage may only appear months or years later, in the form of development disorders, mental retardation or eye disorders, including blindness.

An infection in individuals with compromised immune systems (e.g. AIDS) could lead to an unlimited proliferation of *Toxoplasma* cysts, resulting in cerebral toxoplasmosis in the form of encephalitis.



## DIAGNOSTICS

Serological antibody detection in blood samples is the primary routine method used in diagnostics. There are also direct, microscopic detection methods and nucleic acid detection methods using the polymerase chain

reaction (PCR) for amniotic fluid, spinal fluid, bronchial lavage, eye liquid or placenta material, in addition to the indirect pathogen detection method.

## TREATMENT

Symptoms are treated with antiprotozoal drugs.

## PREVENTATIVE MEASURES

Preventing an initial infection in seronegative pregnant women by avoiding contact with new cats (cats that have not been living in the same household for a longer period of time and cats, the eating habits of which you do not control) and not eating undercooked meat (which pregnant women should avoid anyway). Rinse vegetables thoroughly before eating to wash off potential oocysts from cat faeces. Freezing meat at

-20 °C for 24 hours will ensure the destruction of any cysts potentially present. Lamb or mutton is considered a main source of food-borne toxoplasmosis.

Wear protective gloves when working in the garden to avoid direct contact with cat faeces. Cats should generally be kept away from kitchens and areas in which food is prepared.

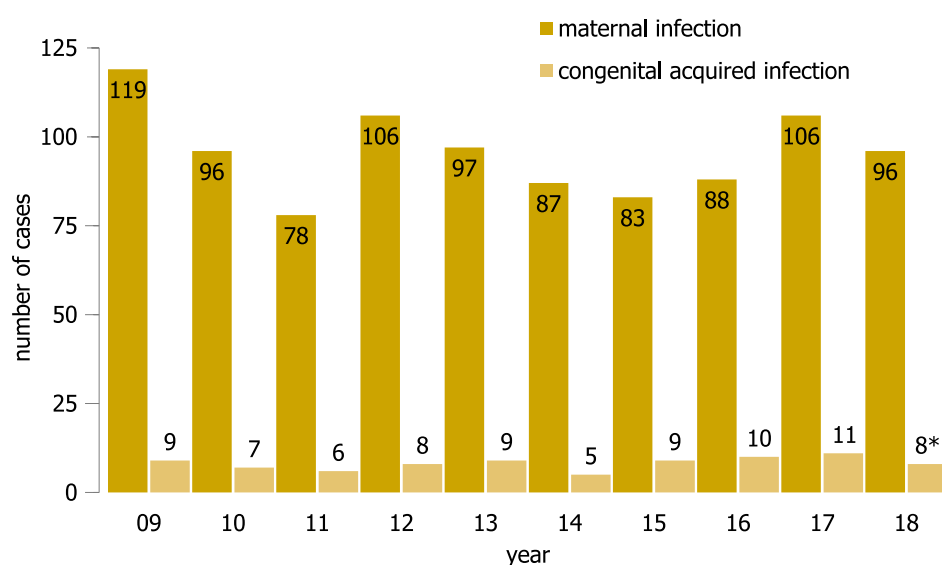
## SITUATION IN AUSTRIA, 2018

### SITUATION IN HUMANS

There is no mandatory obligation to report toxoplasmosis in Austria. The toxoplasmosis laboratory of the Department of Pediatrics and Adolescent Medicine<sup>13</sup> prepares amniotic fluid for PCR analysis from Austrian prenatal centres and examines the blood of the umbilical cord of children of infected pregnant women as part of the quality control programme. This allows a follow-up for children of infected mothers and the documentation of the children's infection status. Nine-

ty-six maternal infections – of which one was a twin pregnancy – were identified in 2018 in the course of toxoplasmosis screening and treated with antiparasitic drugs. Eight prenatal infections with *T. gondii* were diagnosed. The infection status of four more children, who are being treated with antiparasitic drugs (as of 14.06.2019), could not be confirmed yet given their age (under 9 months) – i.e. more congenital cases could be added.

<sup>13</sup> National Toxoplasmosis Register  
Division of Neonatology, Pediatric Intensive Care and Neuropediatrics  
Department of Pediatrics and Adolescent Medicine  
Medical University of Vienna  
1090 Vienna, Währinger Gürtel 18-20  
Contact: Univ.-Prof. Dr. Michael Hayde



\* Congenital infections, 2018: the infection status in four more children who are being treated with antiparasitic drugs (as of 14.06.2019) has not been confirmed as yet, given their age (under 9 months)

**Figure 22:**

Confirmed cases of maternal and congenital toxoplasmosis cases in Austria, 2009–2018 (Toxoplasmosis laboratory at the Department of Paediatrics and Adolescent Medicine, AKH, as of 14.06.2019)

## COMPARISON AUSTRIA AND THE EU<sup>14</sup>, 2017

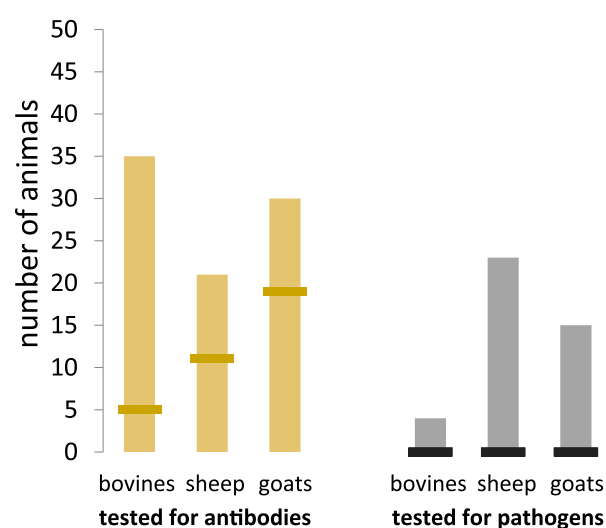
Only a few Member States have an active surveillance system on congenital toxoplasmosis, and most countries report zero cases. Therefore, prevalences cannot be estimated in the EU. In 2017, 40 congenital toxoplasmosis cases were reported from 19 MS, which corresponds to a notification rate of 1.31 per 100,000 live births. Only seven Member States reported at least one confirmed congenital toxoplasmosis case.

The number of cases reported in 2017 was comparable to the annual number of cases that have been reported since 2013, excluding France, which reports data with a two-year delay and represents over 80 % of the annual cases in the EU.

In 2016, France recorded 195 cases of congenital toxoplasmosis (24.9 cases per 100,000 live births).

## SITUATION IN ANIMALS

Animal samples from livestock and cats are only sent to the laboratory to be tested for *Toxoplasma* upon clinical suspicion, such as following still births or out of private interest. In 2018, 35 samples from cattle, 21 from sheep, and 30 samples from goats were examined. Antibodies for *Toxoplasma* were detected in five of the bovine samples, in 11 samples from sheep and 19 from goats; the pathogen *T. gondii* could not be detected in any sample (four samples from cattle, 23 samples from sheep and 15 samples from goats (Fig. 23).



**Figure 23:**

Examined cattle and small ruminants for *T. gondii* or antibodies against *Toxoplasma* in Austria, 2018

<sup>14</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>

# FOOD-BORNE OUTBREAKS IN AUSTRIA

## HYGIENIC AND MICROBIOLOGICAL IMPECCABLE FOOD

**CONSUMERS EXPECT FOOD PRODUCTS TO HAVE IMPECCABLE HYGIENE STANDARDS AND THE FOOD INDUSTRY PUTS GREAT EMPHASIS ON THE QUALITY OF ITS PRODUCTS. IF HUMANS GET SICK FROM CONSUMING FOOD CONTAMINATED BY BACTERIA OR OTHER PATHOGENS, INVESTIGATIONS SHOULD ATTEMPT TO DETERMINE THE CAUSE. IT IS ALMOST IMPOSSIBLE TO FIND OUT THE INFECTION SOURCE AMONG THE MANY FOODS CONSUMED IN INDIVIDUAL CASES.**

However, if a larger number of people are affected during so-called “food-borne outbreaks”, there is a better chance of finding the food product that served as a vehicle for the causative agent, by analysing associations between exposures and illnesses.

### DEFINITION

The Zoonoses Act of 2005 defines food-borne outbreaks as follows: an incidence, observed under given circumstances, of two or more human cases of the same disease and/or infection, or a situation in which

the observed number of cases exceeds the expected number and where the cases are linked, or are probably linked, to the same food source<sup>15</sup>.

### WHY MUST OUTBREAKS BE INVESTIGATED?

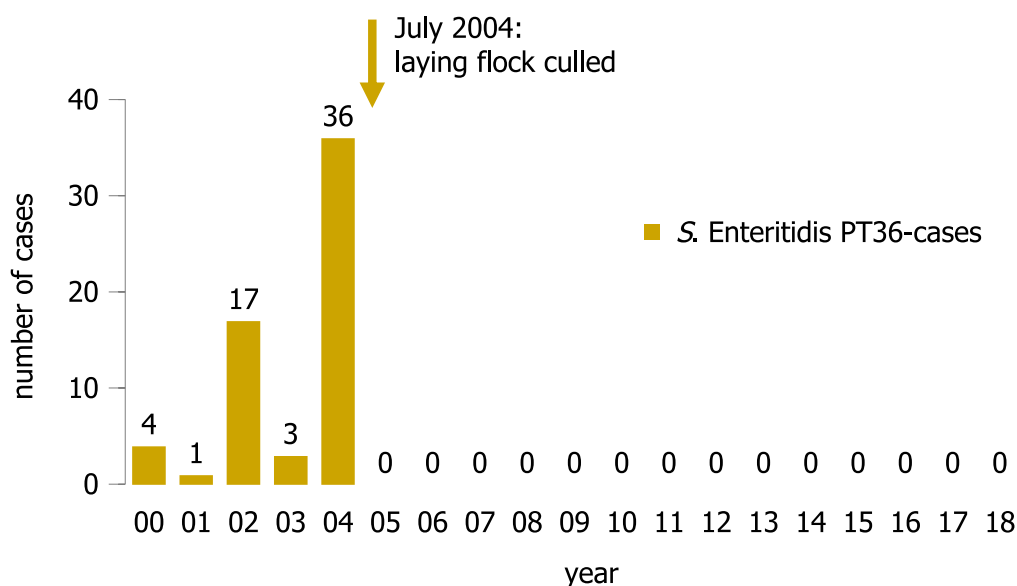
Is there a necessity to investigate outbreaks? Aren't such investigations little more than academic exercises? Is all this effort just put in because the Zoonoses Act requires it? Detailed and systematic searches could help identify both the infection vehicle – i.e. the food source that transmits the infectious agent to humans – and its reservoir - i.e. the habitat of an infectious agent. In the end, this is what enables the authorities to develop and introduce targeted and sen-

sible intervention measures. These activities should result in the source of the outbreak – the pathogen causing the infection – being eliminated from the food chain so that consumers are no longer exposed to this agent. Thus, the objective of outbreak analysis is not only to halt any current outbreak, but also to prevent such an outbreak in the future.

<sup>15</sup> Zoonoses Act of 2005: Federal Law on the Surveillance and Monitoring of Zoonoses and Zoonosis Agents (Zoonosengesetz) StF: BGBl. I Nr. 128/2005

The following historical example illustrates the preventative potential of food-borne outbreak studies: it was possible to identify a flock of laying hens as the reservoir of *Salmonella* Enteritidis phage type 36 – a very rare serovar in Austria – in 2004, which had caused a food-borne outbreak affecting 36 individuals in four

provinces. The flock was culled, the farm thoroughly cleaned and sterilised and an entirely new flock of laying hens brought in. Not one further infection caused by *S. Enteritidis* PT 36 has been documented in Austria since then, thanks to the measures taken (Fig. 24).



**Figure 24:**  
Human infections caused by *S. Enteritidis* PT 36, Austria 2000-2018

## WHO CARRIES OUT THE OUTBREAK INVESTIGATIONS?

Regional district administrations are obliged to begin any investigations and examinations that could help identify the disease and infection source immediately via their official public health officers and veterinarians upon any notification or suspicion of a notifiable disease and, thus, also in the case of food-borne outbreaks. Moreover, the Zoonoses Act of 2005 obliges the relevant authorities to investigate food-borne outbreaks and carry out the appropriate epidemiological and microbiological examinations. To do this, authorities may seek the help of external experts. A mere increase in untargeted food sample

taking has not proven very successful in the past. In the majority of cases, when outbreak investigations get started, the original food product (or the affected, contaminated batch of the infectious food source) is not available for microbiological examinations anymore. In such instances, an epidemiologic study could yield results that could enable the use of preventative measures to avoid similar incidents in the future. The findings of successfully clarified national and international outbreaks over recent years have dispersed any doubt about the necessity and benefits of epidemiologic investigations.



## ANALYSES OF FOOD-BORNE OUTBREAKS IN AUSTRIA, 2018

In 2018, 52 food-borne outbreaks were recorded in Austria. A decrease in outbreaks of 91.5 % has been documented since 2006 (tab. 1). A total of 222 individuals were affected by these outbreaks, nearly the same number of persons as in 2017 (227 cases), but fewer than in any year before. As a result, the incidence of 2.5 patients per 100,000 population linked to food-borne outbreaks in 2018 was nearly the same as in 2017. By comparison, 30.7 individuals per 100,000 population were affected by outbreaks in Austria in 2006 (Fig. 25). Since 2006, the mean of the affected persons per outbreak was 4.4 per year, it was 4.3 per-

sons per outbreak in 2018. Only in 2014, double the number of persons were affected by outbreaks (8.2 cases per outbreak), because very large outbreaks were investigated – e.g. one salmonellosis outbreak affecting 151 persons and one caused by norovirus affecting 146 persons.

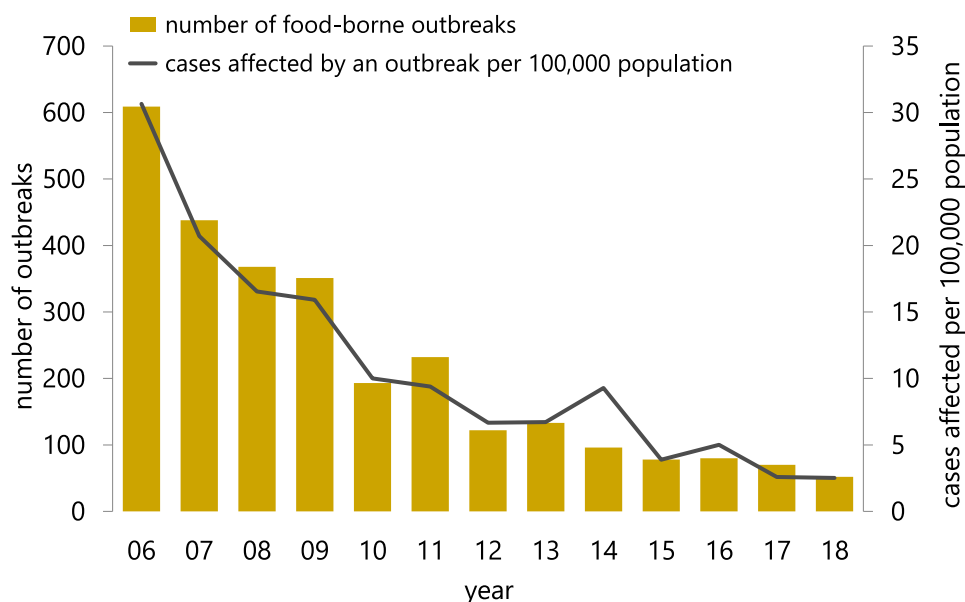
Fifty-eight persons affected by outbreaks were hospitalised, for three outbreaks this information was not available. No fatal case was reported in related with food-borne outbreaks.

**Table 1:**

Number of food-borne outbreaks in Austria, 2006-2018

year	06	07	08	09	10	11	12	13	14	15	16	17	18
<b>number of food-borne outbreaks</b>	609	438	368	351	193	232	122	133	96	78	80	69	52
<b>outbreaks with strong evidence</b>	-	11	14	11	10	7	3	24	13	6	9	9	7
<b>household outbreaks</b>	515	364	305	319	162	196	99	100	80	62	62	50	39
<b>general outbreaks</b>	94	74	63	32	31	36	23	33	16	16	18	19	13
<b>number of cases</b>	2.530	1.715	1.376	1.330	838	789	561	568	790	333	436	227	222
<b>number hospitalised</b>	493	286	338	223	155	179	97	108	121	86	68	56	58*
<b>number of deaths</b>	3	1	0	6	2	0	0	0	1	0	0	2	0

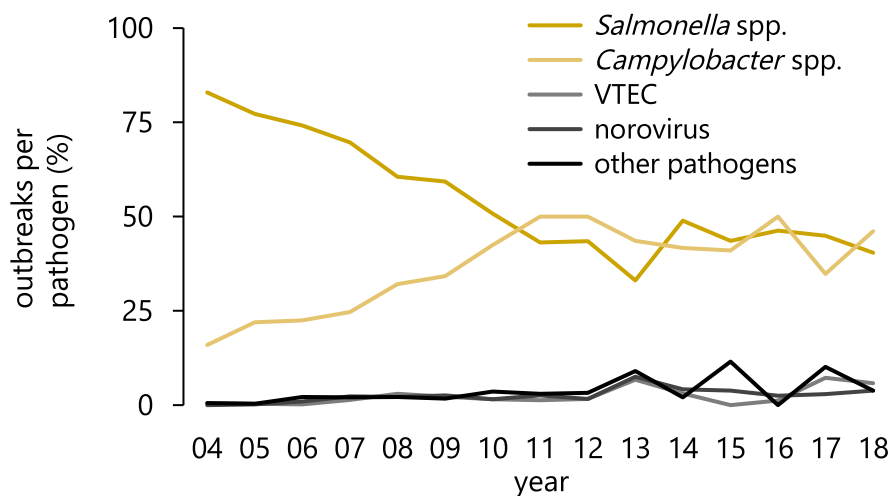
\* for 3 outbreaks the number of hospitalizations is missing.

**Figure 25:**

Number of confirmed food-borne outbreaks and outbreak cases per 100,000 population in Austria, 2006-2018

The decrease in salmonellosis outbreaks of 95 % (454 to 21) between 2006 and 2018 was particularly remarkable. The most frequently detected agent causing outbreaks in 2018 was *Campylobacter* (24 outbreaks, 46.2 %; Fig. 26). Further outbreaks were caused by VTEC (three outbreaks), norovirus (two

outbreaks) *L. monocytogenes* and hepatitis A virus (one each), respectively. Nevertheless, *Salmonella* was the most common outbreak agent in 2017, causing 45 % of all outbreaks, followed by *Campylobacter* (35 %) (fig. 26). Additionally, the number of campylobacteriosis.

**Figure 26:**

Outbreak percentage by agent, 2004-2018

In 2018, *C. jejuni* caused 20 outbreaks, *C. coli* three and in one outbreak, both species very isolated from patients. *S. Enteritidis* was the most frequent serovar of salmonellosis outbreaks (15 outbreaks), *S. Typhimurium* caused four outbreaks, one of these its monophasic variant and in another both simultaneously, the monophasic and biphasic variant. Additionally, *S. Ibadan* and *S. Typhi* were identified, both outbreaks

associated with travel abroad. In VTEC outbreaks, serotype O157:H7 and O103:HNM were detected, in one outbreak simultaneously serotype O91:HNM and O128:H not-typable. In the listeriosis outbreak, *L. monocytogenes* serotype 4b was typed, the outbreak caused by hepatitis A virus genotype IB SW 18-9763 was typed.

## TYPES OF FOOD-BORNE OUTBREAKS

The Austrian Zoonoses Act obliges AGES to collect outbreak data and forward the data to the EU on an annual basis. There are specific classifications within this reporting: outbreaks in which only members of one single household are affected are counted as household outbreaks. Should the outbreak affect individuals from several households, this is counted as a general outbreak. Household outbreaks make up the majority every year, as it is often impossible to find an epidemiological link between different household outbreaks by identifying one single food source as the cause. In 2018, 75 % of all outbreaks were classified as household outbreaks.

Outbreaks are also classified as strong- and weak-evidence outbreaks in line with the EU reporting system, meaning whether a specific food item could be identified as being the likely outbreak vehicle or that the evidence for a specific food being the source is very vague. Strong evidence would include a statistically significant association in an analytic-epidemiologic study or convincing, descriptive evidence, microbio-

logical proof of the outbreak strain in the cases and in the food product or environment of the food produced, or evidence from tracing the product back to its source.

In 2018, seven strong-evidence outbreaks (13.5 %) were reported to the EU. This figure is similar to that of 2017 (13.0 %) and 2016 (12.5 %). Three of the strong-evidence, food-borne outbreaks were caused by *S. Enteritidis*, two outbreaks by *C. jejuni* and one each by *L. monocytogenes* and the hepatitis A virus. The following foods were identified as infection sources in the strong-evidence outbreaks: eggs and egg products (two times), meat and meat products (two times), and once each chicken meat and products thereof, frozen strawberries and mixed foods. Eighteen outbreaks (more than one third) could be connected to stays abroad (13 times *Salmonella*, three times *Campylobacter* and two times VTEC). In the previous years the proportion of outbreaks acquired abroad was between 7 % and 19 %.

## FOOD-BORNE OUTBREAKS AFFECTING TWO OR MORE PROVINCES, 2018

In 2018, one food-borne outbreak affecting more than one province caused by hepatitis A virus was investigated and clarified. At first, this outbreak was recognised in Sweden (20 cases). The international exchange of the gene sequences of that strain revealed 16 cases belonging to the same cluster in Austria. Frozen strawberries originating from Poland were identified as the vehicle for the virus by gene analysis and by tracing back of the product. In Austria,

six persons from Lower Austria, five from Burgenland, four from Vienna and one from Styria were affected. Twelve of 14 responding cases indicated to having consumed strawberry ice cream during the incubation period, and nine cases remembered the restaurant where they ate the ice cream. Eight cases could be linked to the incriminated producer of the strawberries in Poland.

---

## COMPARISON AUSTRIA AND THE EU<sup>16</sup>, 2017

---

A direct comparison between the individual Member States is not possible, as the quality of the reporting systems used within the European Union for food-borne infections differ greatly and there are no EU-wide standardised systems to investigate outbreaks. The fact that more than one quarter of all outbreaks were reported from France, and seven MS (Belgium, Germany, the Netherlands, Poland, Slovakia, Spain and Sweden) recorded additional 60 % of all outbreaks, reflects the different levels of sensitivity in the national surveillance systems in the MS.

In 2017, 5,079 food-borne outbreaks (2016: 4,786; 2015: 4,362) with 43,400 cases involved and 33 deaths were reported. The number of outbreaks was between 0.06 per 100,000 population in Greece, Romania and in the United Kingdom and 8.5 per 100,000 in Slovakia. For comparison, the incidence of outbreaks in Austria was 0.79; the reporting rate in the EU was 0.99 per 100,000 population.

An important limitation of the FBO data analysis is that in 2017 38 % of the outbreaks (1,909 outbreaks) reported to the EFSA lack information on the causative agent. *Salmonella* caused 24.4 % of all outbreaks, bacterial toxins 15.9 % and *Campylobacter* 7.7 %. Food-borne viruses (norovirus, hepatitis A virus, and

others) which were reported as the most frequent outbreak agents in 2014 – in 2017, they only counted for 7.8 % of all outbreaks.

An analysis of outbreaks with strong evidence (643 outbreaks or 12.7 % of all; in Austria 13.5 %) revealed that 60 % of these are associated with foodstuffs of animal origin, with all kinds of meats and meat products (121 outbreaks), followed by fish and fishery products (106 outbreaks), eggs and egg products (105 outbreaks) and milk and milk products (49 outbreaks).

Households were the most frequently reported place of exposure in cases of contaminated foods, with one in three outbreaks occurring in this setting. The diversity of causative agents reported in the household setting was the largest one compared to other settings, with *Salmonella* being most frequently reported agent (61.4 %). In addition, *C. botulinum*, *Trichinella* and mushrooms toxins were only reported as causative agents in the household setting. Outbreaks in 'Canteens or catering to workplaces, schools, hospitals etc.' were predominantly caused by bacterial toxins other than *C. botulinum*, as well as by norovirus and other caliciviruses (all together 58 %).

---

<sup>16</sup> EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. <https://doi.org/10.2903/j.efsa.2018.5500>

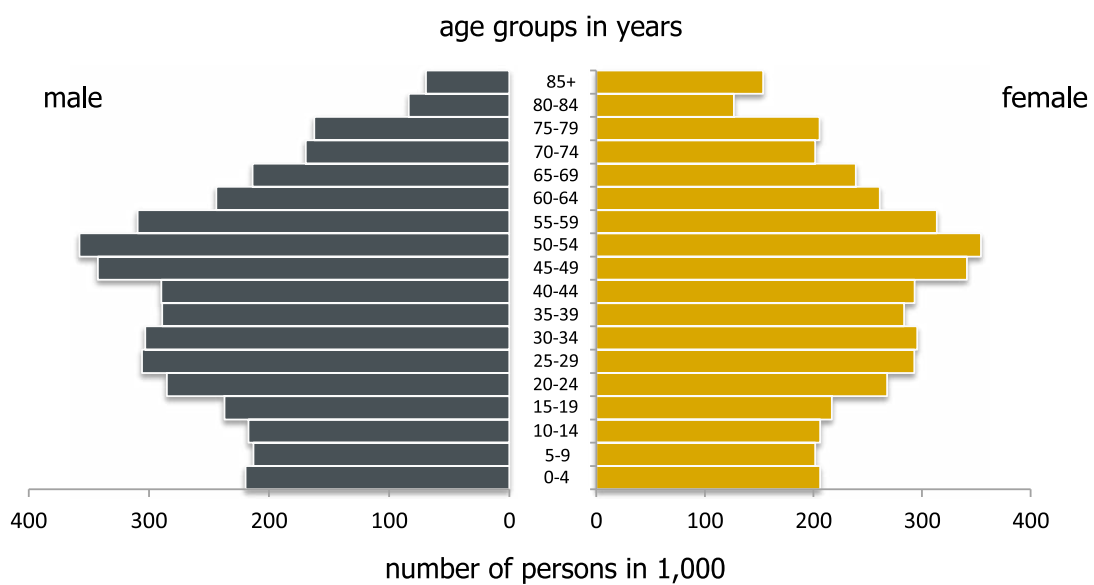


## ANNEX

## AUSTRIA'S POPULATION IN 2018

On January 1<sup>st</sup>, 2018 Austria's population was 8,822,167 people, of whom 4,483,749 were female and 4,338,518 were male (STATISTIK AUSTRIA,

Statistik des Bevölkerungsstandes, as of 17.05.2018). Figure 27 depicts the Austrian population by age group (five-year intervals) and gender.



**Figure 27:**  
Austrian population on January 1<sup>st</sup>, 2018 (STATISTIK AUSTRIA, as of 17.05.2018)



## ANIMAL POPULATION AND SLAUGHTERED ANIMALS IN AUSTRIA, 2018

In Table 2, Austria's livestock population and the level of slaughtering per animal species in 2018 are

depicted, changes compared to 2017 are indicated by arrows.

**Table 2:**

Animal population and slaughtered animals in Austria, 2018 (data source: VIS, Statistics Austria and QGV)

animal species	holdings*	flocks*	animals*	slaughtered animals*
Bovines <sup>1</sup>	59,519 ↓	-	1,931.616 ↓	694,232 ↑
pigs <sup>1</sup>	28,664 ↓	-	2,862.044 ↓	5,151,074 ↓
sheep <sup>1</sup>	17,220 ↓	-	465,854 ↑	294,894 ↑
goats <sup>1</sup>	10,286 ↓	-	115,259 ↑	52,938 ↑
horses <sup>1</sup>	18,660 ↑	-	92,554 ↑	618 ↑
farmed game <sup>1</sup>	2,002 ↑	-	47,395 ↑	-
wild boars, farmed <sup>1</sup>	4 ↓	-	126 ↑	-
rabbits <sup>1</sup>	5,394 ↓	-	43,712 ↓	-
<i>Gallus gallus</i> (fowl)	-	-	-	85,694,000 ↑
breeding animals, fowl (egg- and meat production line) <sup>2</sup>	84 ↑	163 ↑	1,272,370 ↑	-
broilers <sup>2</sup>	620 ↑	5,237 ↑	71,492,948 ↑	-
laying hens <sup>2</sup>	1,146 ↑	2,946 ↑	10,185,833 ↑	-
turkeys <sup>2</sup>	150 ↓	456 ↑	2,022,504 ↓	-

\* Changes compared to the previous year, ↑ oder ↓

<sup>1</sup> Bovines, pigs, sheep, goats, horses, farmed game, wild boars and rabbits: number of holdings and animals from VIS as of 1. April 2018

<sup>2</sup> All poultry: flocks and animals produced during the whole year; data from QGV as of 7<sup>th</sup> February 2019

# LIST OF NATIONAL REFERENCE LABORATORIES/CENTRES WITH CONTACTS<sup>17</sup>



## **National Reference Centre and National Reference Laboratory for *Salmonella***

Institute for Medical Microbiology & Hygiene, Graz  
Centre for Food-borne Infectious Diseases  
Austrian Agency for Health and Food Safety  
8010 Graz, Beethovenstraße 6  
Contact: Dr. Christian Kornschöber

## **National Reference Centre for *Campylobacter*/National Reference Laboratory for *Campylobacter***

Institute for Medical Microbiology & Hygiene, Graz  
Centre for Food-borne Infectious Diseases  
Austrian Agency for Health and Food Safety  
8010 Graz, Beethovenstraße 6  
Contact: Mag. Dr. Sandra Jelovčan

## **National Reference Centre and National Reference Laboratory for *Brucella***

Institute for Veterinary Disease Control, Mödling  
Austrian Agency for Health and Food Safety  
2340 Mödling, Robert-Koch-Gasse 17  
Contact: Dr. Erwin Hofer

## **National Reference Laboratory for *Listeria***

*Listeria* Institute for Medical Microbiology & Hygiene, Graz  
Centre for Food-borne Infectious Diseases  
Austrian Agency for Health and Food Safety  
8010 Graz, Beethovenstraße 6  
Contact: Mag. Dr. Ariane Pietzka

## **National Reference Centre for *Listeria* (Binational Conciliar Laboratory for *Listeria* Germany/Austria)**

Institute for Medical Microbiology & Hygiene, Vienna  
Centre for Anthropogenic Infections  
Austrian Agency for Health and Food Safety  
1090 Vienna, Währinger Straße 25a  
Contact: Dr. Steliana Huhulescu

## **National Reference Centre for Toxoplasmosis, Echinococcosis, Toxocariasis and other Parasitic Diseases**

Department for Medical Parasitology  
Institute for Specific Prophylaxis and Tropical Medicine  
Centre for Pathophysiology, Infectiology and Immunology Medical University of Vienna  
1090 Vienna, Kinderspitalgasse 15  
Contact: Univ.-Prof. Dr. Herbert Auer or Univ.-Prof. Dr. Ursula Wiedermann-Schmidt

<sup>17</sup> The list of Reference Laboratories and Centres in the human fields, and according to Chapter 3 of EC Decision 2009/712/EG, can be found on the homepage of the Federal Ministry of Health and Women's Affairs ([https://www.sozialministerium.at/cms/site/attachments/8/7/2/CH4060/CMS1282307727776/liste\\_nationaler\\_referenzzentralen\\_-labors\\_-\\_update\\_juni\\_2018.pdf](https://www.sozialministerium.at/cms/site/attachments/8/7/2/CH4060/CMS1282307727776/liste_nationaler_referenzzentralen_-labors_-_update_juni_2018.pdf))

**National Toxoplasmosis Register, Toxoplasmosis Laboratory and Out-Patient Clinic**

Toxoplasmosis Diagnostics during Pregnancy and Paediatric Follow-Up  
Division of Neonatology, Intensive Care Medicine and Neuropediatrics  
Department of Pediatrics and Adolescent Medicine  
Medical University of Vienna  
1090 Vienna, Währinger Gürtel 18-20  
Contact: Univ.-Prof. Dr. Michael Hayde

**National Reference Laboratory for *Trichinella* in Animals**

Institute for Veterinary Disease Control, Innsbruck  
Austrian Agency for Health and Food Safety  
6020 Innsbruck, Technikerstraße 70  
Contact: Dr. Walter Glawischnig

**National Reference Centre for Tuberculosis**

Institute for Medical Microbiology & Hygiene, Vienna  
Centre for Anthropogenic Infections  
Austrian Agency for Health and Food Safety  
1096 Vienna, Währinger Straße 25a  
Contact: PD Mag. Dr. Alexander Indra

**National Reference Laboratory for Bovine Tuberculosis**

Institute for Veterinary Disease Control, Mödling  
Austrian Agency for Health and Food Safety  
2340 Mödling, Robert-Koch-Gasse 17  
Contact: Dr. Erwin Hofer

**National Reference Centre and National Reference Laboratory for *Escherichia coli*, including Verotoxigenic *E. coli***

Institute for Medical Microbiology & Hygiene, Graz  
Centre for Food-borne Infectious Diseases  
Austrian Agency for Health and Food Safety  
8010 Graz, Beethovenstraße 6  
Contact: Mag. Dr. Sabine Schlager

**National Reference Centre und National Reference Laboratory for Yersiniosis**

Institute for Medical Microbiology & Hygiene, Graz  
Centre for Food-borne Infectious Diseases  
Austrian Agency for Health and Food Safety  
8010 Graz, Beethovenstraße 6  
Contact: Dr. Shiva Pekard-Amenitsch



## IMPRINT

### Owner, Publisher and Editor:

AGES – Austrian Agency for Health and Food Safety  
Spargelfeldstraße 191 | 1220 Vienna

Phone: +43 (0)5 0555-0

E-Mail: [zoonosenbroschuere@ages.at](mailto:zoonosenbroschuere@ages.at)

[www.ages.at](http://www.ages.at)

**Editorial:** Division for Data, Statistics and Risk Assessment  
Division of Animal Health  
Division for Public Health  
Division for Food Safety  
Division for Food Security

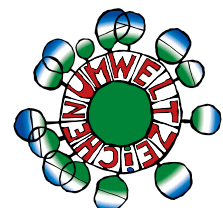
**Design & Layout:** strategy-design

**Photos:** AGES, BMASGK/Zinner, Fotolia, Shutterstock, Ingimage

**Electron-microscopy photos:**  
AGES Tiergesundheits/Susanne Richter

**Light-microscopy photos:**  
AGES Tiergesundheits/Walter Glawischnig

**Print:** Bösmüller Print Management Gesmbh & Co KG



© AGES, Juli 2019

Typesetting and printing errors reserved. All rights reserved. Reprints – including excerpts – or other reproduction, processing or distribution, also using electronic systems, only allowed with written consent of AGES. This print publication was printed in accordance with the Printing Directive of the Austrian Environmental Label.



HEALTHY LIFE FOR HUMANS,  
ANIMALS AND PLANTS!



**ADDRESS** Spargelfeldstraße 191, 1220 Vienna **WEB** [www.ages.at](http://www.ages.at)

**E-MAIL** [presse@ages.at](mailto:presse@ages.at)

**PHONE** +43 50 555-0